Ex.No. 1 **NETWORKING COMMANDS**

AIM:

To use and study the commands tcpdump, netstat, ifconfig, nslookup and traceroute. To capture ping and traceroute PDUs using a network protocol analyzer and examine.

1. tcpdump (for LINUX)

Tcpdump is a command line utility that allows you to capture and analyze network traffic going through your system.

PROCEDURE:

Check if tcpdump is installed on your system

```
$ which tcpdump
/usr/sbin/tcpdump
```

If tcpdump is not installed,

```
$ sudo yum install -y tcpdump
```

To get Supervisor Privilege

```
$ su
```

(And password vvcse@123)

($ is changed to # and the commands can be executed in supervisor)

Capturing packets with tcpdump

Use the command tcpdump -D to see which interfaces are available for capture.

```
[root@localhost it]# tcpdump -D
1.nflog (Linux netfilter log (NFLOG) interface)
2.nfqueue (Linux netfilter queue (NFQUEUE) interface)
3.usbmon1 (USB bus number 1)
4.enp2s0
5.usbmon2 (USB bus number 2)
6.any (Pseudo-device that captures on all interfaces)
7.lo [Loopback]
```

Capture all packets in any interface by running this command:

```
[root@localhost it]# tcpdump -i any
06:03:58.258143 ARP, Request who-has 172.16.51.87 tell 172.16.22.25, length 46
06:03:58.258225 ARP, Request who-has 172.16.51.88 tell 172.16.22.25, length 46
06:03:58.260828 ARP, Request who-has 172.16.51.122 tell 172.16.22.25, length 46
06:03:58.260903 ARP, Request who-has 172.16.51.123 tell 172.16.22.25, length 46
^C
5244 packets captured
59636 packets received by filter
54378 packets dropped by kernel
```

(Press ctrl+C to stop execution)

Filter packets based on the source or destination IP Address

[root@localhost it]#**tcpdump -i any -c5 -nn src 172.16.20.138**
6:10:30.712414 ARP, Request who-has 172.16.16.16 tell 172.16.20.138, length 28
06:10:31.483765 IP 172.16.20.138.47997 > 51.158.186.98.123: NTPv4, Client, length 48
5 packets captured
5 packets received by filter
0 packets dropped by kernel
[root@localhost it]#**tcpdump -i any -c5 -nn dst 172.16.20.139**
6:10:30.712414 ARP, Request who-has 172.16.16.16 tell 172.16.20.138, length 28
06:10:31.483765 IP 172.16.20.138.47997 > 51.158.186.98.123: NTPv4, Client, length 48
5 packets captured
5 packets received by filter
0 packets dropped by kernel
Filtering packets

To filter packets based on protocol, specifying the protocol in the command line. For example, capture ICMP packets only by using this command:

[root@localhost it]# **tcpdump -i any -c5 icmp**
(tcpdump captures and displays only the ICMP-related packets.)
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on any, link-type LINUX_SLL (Linux cooked), capture size 262144 bytes
06:15:07.800786 IP localhost.localdomain > ec2-54-204-39-132.compute-1.amazonaws.com: ICMP echo request, id 8180, seq 13, length 64
06:15:08.063488 IP ec2-54-204-39-132.compute-1.amazonaws.com > localhost.localdomain: ICMP echo reply, id 8180, seq 13, length 64
5 packets captured
5 packets received by filter
0 packets dropped by kernel

a). windump (for Windows)

WinDump is the Windows version of tcpdump, the command line network analyzer for UNIX. WinDump is fully compatible with tcpdump and can be used to watch, diagnose and save to disk network traffic according to various complex rules.

INSTALLATION PROCEDURE:

1. Download and install Windump (http://www.winpcap.org/windump/)
2. You will need to place your network card into promiscuous mode – for this, install WinPcap. Download and install WinPcap. (http://www.winpcap.org/install/default.htm)

Testing Procedure:

1. Open a Command Prompt with Administrator Rights
2. Change the directory to your download directory

   cd c:\Program Files

3. Run windump to collect packets

c:\Program Files\windump

4.Run windump to locate your network adapter

c:\Program Files\windump –D

5. Windump will list your adapter with a number.

You may have several adapters listed. You select the interface to start running windump. (as shown in step 5 using interface number 1).

6. Run windump to collect packets and write out to a file

c:\Program Files\windump -i 1 -q -w C:\perflogs\diagTraces -n -C 30 -W 10 -U -s 0

This will create a directory c:\perflogs\ and a file called diagTrace0.

The switches mean this:

-i is the number of NIC selected in the previous step

-q is quiet mode

-w <name> is the prefix of the files to create

-n the logging will not resolve host names, all data will be in IP address format

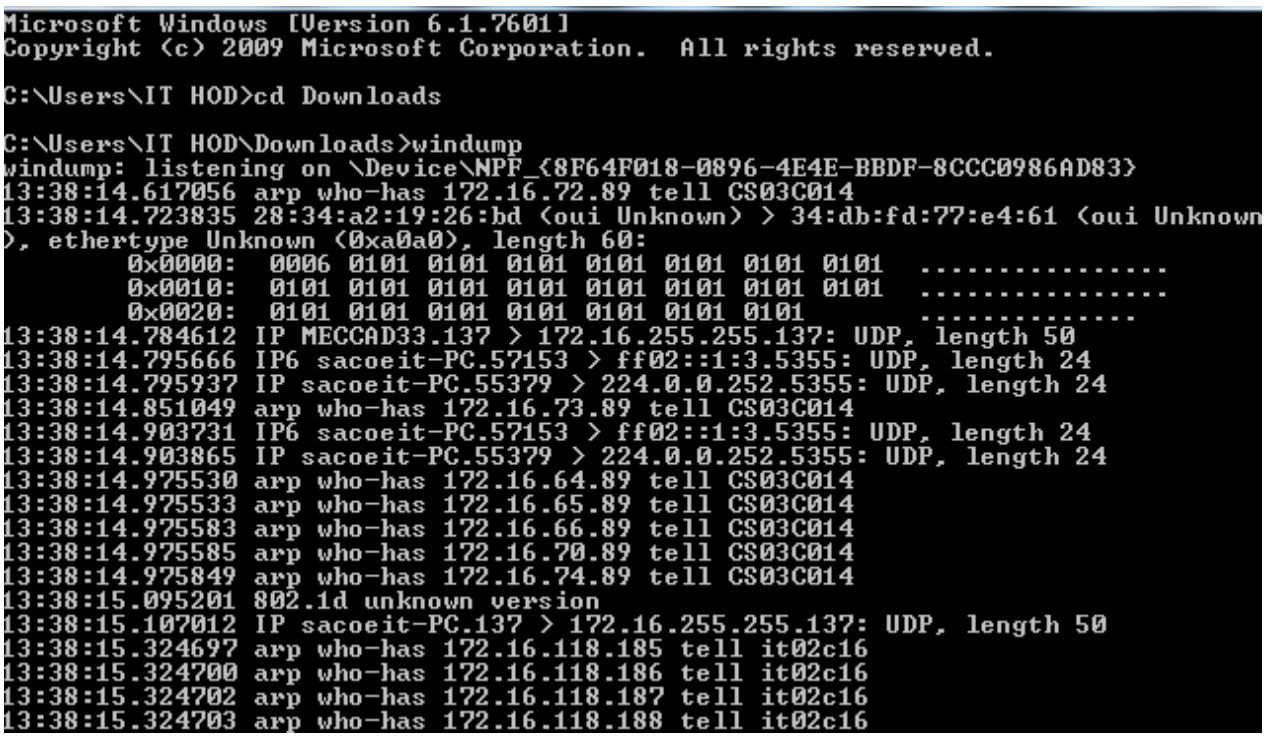
-C the size in Millions of Bytes the logs files so grow to before moving to the next file

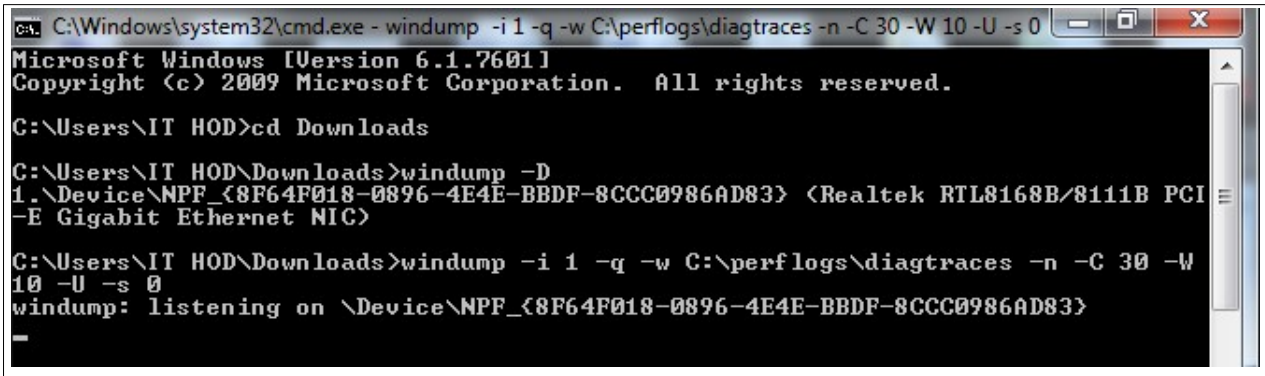
-W the number of circular log files to retain in addition to the current log file, specify in <path>

where the files are to be stored

-U as each packet is saved, it will be written to the output file

-s decreases the amount of packet buffering, set this to zero





2. netstat (For LINUX and Windows)

netstat (network statistics) is a command line tool for monitoring network connections both incoming and outgoing as well as viewing routing tables, interface statistics etc.

```
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation.  All rights reserved.

C:\Users\IT HOD>netstat

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    127.0.0.1:49218        ITHOD-PC:49219         ESTABLISHED
  TCP    127.0.0.1:49219        ITHOD-PC:49218         ESTABLISHED
  TCP    127.0.0.1:49252        ITHOD-PC:49253         ESTABLISHED
  TCP    127.0.0.1:49253        ITHOD-PC:49252         ESTABLISHED
  TCP    127.0.0.1:49269        ITHOD-PC:49270         ESTABLISHED
  TCP    127.0.0.1:49270        ITHOD-PC:49269         ESTABLISHED
  TCP    127.0.0.1:49295        ITHOD-PC:49296         ESTABLISHED
  TCP    127.0.0.1:49296        ITHOD-PC:49295         ESTABLISHED
  TCP    172.16.22.129:8194     SOPHOSESG:64609        ESTABLISHED
  TCP    172.16.22.129:8194     ITHOD-PC:49293         ESTABLISHED
  TCP    172.16.22.129:49220    74.125.24.188:5228     ESTABLISHED
  TCP    172.16.22.129:49258    SOPHOSESG:8194         ESTABLISHED
  TCP    172.16.22.129:49293    ITHOD-PC:8194          ESTABLISHED
  TCP    172.16.22.129:50690    sacoe-PC:microsoft-ds  ESTABLISHED

C:\Users\IT HOD>
```

```
Displays protocol statistics and current TCP/IP network connections.

NETSTAT [-a] [-b] [-e] [-f] [-n] [-o] [-p proto] [-r] [-s] [-t] [interval]

  -a            Displays all connections and listening ports.
  -b            Displays the executable involved in creating each connection or
                listening port. In some cases well-known executables host
                multiple independent components, and in these cases the
                sequence of components involved in creating the connection
                or listening port is displayed. In this case the executable
                name is in [] at the bottom, on top is the component it called,
                and so forth until TCP/IP was reached. Note that this option
                can be time-consuming and will fail unless you have sufficient
                permissions.
  -e            Displays Ethernet statistics. This may be combined with the -s
                option.
  -f            Displays Fully Qualified Domain Names (FQDN) for foreign
                addresses.
  -n            Displays addresses and port numbers in numerical form.
  -o            Displays the owning process ID associated with each connection.
  -p proto      Shows connections for the protocol specified by proto; proto
                may be any of: TCP, UDP, TCPv6, or UDPv6.  If used with the -s
                option to display per-protocol statistics, proto may be any of:
                IP, IPv6, ICMP, ICMPv6, TCP, TCPv6, UDP, or UDPv6.
  -r            Displays the routing table.
  -s            Displays per-protocol statistics.  By default, statistics are
                shown for IP, IPv6, ICMP, ICMPv6, TCP, TCPv6, UDP, and UDPv6;
                the -p option may be used to specify a subset of the default.
  -t            Displays the current connection offload state.
  interval      Redisplays selected statistics, pausing interval seconds
                between each display.  Press CTRL+C to stop redisplaying
                statistics.  If omitted, netstat will print the current
                configuration information once.
```

3. ifconfig (For LINUX)

It displays the details of a network interface card like IP address, MAC Address, and the status of a network interface card.

```
[it@localhost ~]$ ifconfig
enp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
inet 172.16.20.138  netmask 255.255.0.0  broadcast 172.16.255.255
inet6 fe80::d884:13bc:fd22:2d43  prefixlen 64  scopeid 0x20<link>
ether a0:8c:fd:e7:10:86  txqueuelen 1000  (Ethernet)
RX packets 4474083  bytes 280780119 (267.7 MiB)
RX errors 0  dropped 353  overruns 0  frame 0
TX packets 14455  bytes 1798944 (1.7 MiB)
TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
inet 127.0.0.1  netmask 255.0.0.0
inet6 ::1  prefixlen 128  scopeid 0x10<host>
loop  txqueuelen 1000  (Local Loopback)
RX packets 4154  bytes 352264 (344.0 KiB)
RX errors 0  dropped 0  overruns 0  frame 0
TX packets 4154  bytes 352264 (344.0 KiB)
TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

a). ipconfig (For Windows)

(internet protocol configuration) is a console application of some operating systems that displays all current TCP/IP network configuration values and refresh Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) settings.

```
C:\Users\IT HOD>ipconfig

Windows IP Configuration


Ethernet adapter Local Area Connection:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::20dc:3b80:28fe:343%11
   IPv4 Address. . . . . . . . . . . : 172.16.22.129
   Subnet Mask . . . . . . . . . . . : 255.255.0.0
   Default Gateway . . . . . . . . . : 172.16.16.16

Tunnel adapter isatap.{8F64F018-0896-4E4E-BBDF-8CCC0986AD83}:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

C:\Users\IT HOD>
```

4. nslookup (For LINUX and Windows)

nslookup (stands for "Name Server Lookup") is a useful command for getting information from DNS server. It is a network administration tool for querying the Domain Name System (DNS) to obtain domain name or IP address mapping or any other specific DNS record.

1. **nslookup annauniv.edu**
2. **nslookup 172.217.26.206**
3. **nslookup -type=any annauniv.edu**

a). nslookup -type=ns annauniv.edu

```
C:\Users\IT HOD>nslookup -type=ns annauniv.edu
Server:  dns.google
Address:  8.8.8.8

Non-authoritative answer:
annauniv.edu    nameserver = ns1.annauniv.edu

C:\Users\IT HOD>_
```

```
C:\Users\IT HOD>nslookup annauniv.edu
Server:  dns.google
Address:  8.8.8.8

Non-authoritative answer:
Name:    annauniv.edu
Address:  14.139.161.7


C:\Users\IT HOD>nslookup 172.217.26.206
Server:  dns.google
Address:  8.8.8.8

Name:    maa03s23-in-f206.1e100.net
Address:  172.217.26.206


C:\Users\IT HOD>nslookup -type=any annauniv.edu
Server:  dns.google
Address:  8.8.8.8

Non-authoritative answer:
annauniv.edu    internet address = 14.139.161.7
annauniv.edu    text =

        "v=spf1 ip4:14.139.161.8 -all"
annauniv.edu
        primary name server = ns1.annauniv.edu
        responsible mail addr = root.annauniv.edu
        serial  = 20190820
        refresh = 300 (5 mins)
        retry   = 900 (15 mins)
        expire  = 604800 (7 days)
        default TTL = 86400 (1 day)
annauniv.edu    nameserver = ns1.annauniv.edu
annauniv.edu    MX preference = 0, mail exchanger = sonic.annauniv.edu
```

5. traceroute (For LINUX)

The traceroute command is used in Linux to map the journey that a packet of information undertakes from its source to its destination.

[it@localhost ~]$ **traceroute**

Usage:

traceroute [-46dFITnreAUDV] [-f first_ttl] [-g gate,...] [-i device] [-m max_ttl] [-N squeries] [-p port] [-t tos] [-l flow_label] [-w waittime] [-q nqueries] [-s src_addr] [-z sendwait] [--fwmark=num] host [packetlen]

Options:

-4	Use IPv4
-6	Use IPv6
-d --debug	Enable socket level debugging
-F --dont-fragment	Do not fragment packets

[it@localhost ~]$ **traceroute annauniv.edu**
traceroute to annauniv.edu (103.70.60.38), 30 hops max, 60 byte packets
1 117.193.124.33 (117.193.124.33) 1.389 ms 1.216 ms 1.072 ms
2 172.16.199.74 (172.16.199.74) 1.902 ms 1.834 ms 1.761 ms
3 218.248.235.161 (218.248.235.161) 27.212 ms * *
4 * * *
5 218.248.178.42 (218.248.178.42) 15.521 ms * *
6 * * *
7 madurai-eg-175.232.249.45.powergrid.in (45.249.232.175) 16.007 ms 15.345 ms 15.867 ms

[it@localhost ~]$ **traceroute 172.16.20.139**
traceroute to 172.16.20.139 (172.16.20.139), 30 hops max, 60 byte packets
1 localhost.localdomain (172.16.20.138) 3004.348 ms !H 3004.215 ms !H 3004.104 ms !H

a). tracert (For Windows)

The tracert command is a Command Prompt command that's used to show several details
about the path that a packet takes from source to destination.

1. **tracert /?**
2. **tracert drsacoe.com**
3. **tracert 172.16.20.139**

```
C:\Users\IT HOD>tracert /?

Usage: tracert [-d] [-h maximum_hops] [-j host-list] [-w timeout]
               [-R] [-S srcaddr] [-4] [-6] target_name

Options:
    -d                  Do not resolve addresses to hostnames.
    -h maximum_hops     Maximum number of hops to search for target.
    -j host-list        Loose source route along host-list (IPv4-only).
    -w timeout          Wait timeout milliseconds for each reply.
    -R                  Trace round-trip path (IPv6-only).
    -S srcaddr          Source address to use (IPv6-only).
    -4                  Force using IPv4.
    -6                  Force using IPv6.

C:\Users\IT HOD>_
```

```
Trace complete.

C:\Users\IT HOD>tracert 172.16.20.139

Tracing route to 172.16.20.139 over a maximum of 30 hops

  1  ITHOD-PC [172.16.22.129]  reports: Destination host unreachable.

Trace complete.

C:\Users\IT HOD>_
```

```
C:\Users\IT HOD>tracert -d 8.8.8.8

Tracing route to 8.8.8.8 over a maximum of 30 hops

  1     1 ms     1 ms     1 ms  117.193.124.33
  2     1 ms     1 ms     1 ms  172.16.199.74
  3    19 ms    19 ms    19 ms  218.248.255.5
  4    19 ms     *        *     218.248.255.6
  5     *        *        *     Request timed out.
  6    25 ms    22 ms    25 ms  72.14.211.114
  7    22 ms    22 ms    22 ms  108.170.253.113
  8    21 ms    21 ms    21 ms  216.239.43.173
  9    22 ms    22 ms    22 ms  8.8.8.8

Trace complete.

C:\Users\IT HOD>_
```

```
Trace complete.

C:\Users\IT HOD>tracert drsacoe.com

Tracing route to drsacoe.com [184.168.221.39]
over a maximum of 30 hops:

  1     1 ms     1 ms     1 ms  117.193.124.33
  2    10 ms     1 ms     1 ms  172.16.199.74
  3    13 ms     *        *     218.248.255.5
  4     *       10 ms    10 ms  218.248.255.6
  5    21 ms    21 ms    21 ms  115.110.161.85.static.vsnl.net.in [115.110.161.8
5]
  6    21 ms    21 ms    21 ms  115.114.85.222
  7    21 ms    21 ms    21 ms  115.114.85.241
  8   149 ms   148 ms   149 ms  if-ae-3-3.tcore2.cxr-chennai.as6453.net [180.87.
36.6]
  9   154 ms   154 ms   153 ms  if-ae-9-2.tcore2.mlv-mumbai.as6453.net [180.87.3
7.10]
 10   147 ms   147 ms   147 ms  if-ae-2-2.tcore1.mlv-mumbai.as6453.net [180.87.3
8.1]
 11   157 ms   155 ms   154 ms  if-ae-5-6.tcore1.wyn-marseille.as6453.net [180.8
7.38.126]
 12   155 ms   156 ms   155 ms  if-ae-8-1600.tcore1.pye-paris.as6453.net [80.231
.217.6]
 13   156 ms   156 ms   161 ms  if-ae-11-2.tcore1.pvu-paris.as6453.net [80.231.1
53.49]
 14   263 ms   263 ms   263 ms  80.231.153.66
 15     *        *        *     Request timed out.
 16   324 ms   324 ms   324 ms  4.28.83.74
 17     *        *        *     Request timed out.
 18   321 ms   322 ms   321 ms  148.72.32.7
 19   327 ms   327 ms   327 ms  be38.trmc0215-01.ars.mgmt.phx3.gdg [184.168.0.69
]
 20   323 ms   324 ms   325 ms  ip-184-168-0-94.ip.secureserver.net [184.168.0.9
4]
 21   333 ms   333 ms   333 ms  ip-184-168-221-39.ip.secureserver.net [184.168.2
21.39]

Trace complete.

C:\Users\IT HOD>
```

6. **ping command**

The ping command is a Command Prompt command used to test the ability of the source computer to reach a specified destination computer. The ping command is usually used as a simple way to verify that a computer can communicate over the network with another computer or network device.

The ping command operates by sending Internet Control Message Protocol (ICMP) Echo Request messages to the destination computer and waiting for a response. How many of those responses are returned, and how long it takes for them to return, are the two major pieces of information that the ping command provides.

a). ping 127.0.0.1

To test whether or not TCP/IP is functioning on the local host, first ping the loopback address 127.0.0.1

```
C:\Users\IT HOD>ping 127.0.0.1

Pinging 127.0.0.1 with 32 bytes of data:
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

Ping statistics for 127.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\IT HOD>
```

b).ping localhost

To test host name cache resolution, ping the name localhost. This is an alias for the loopback address

```
C:\Users\IT HOD>ping localhost

Pinging ITHOD-PC [::1] with 32 bytes of data:
Reply from ::1: time<1ms
Reply from ::1: time<1ms
Reply from ::1: time<1ms
Reply from ::1: time<1ms

Ping statistics for ::1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\Users\IT HOD>
```

c). ping <IPv4 address> (Ping the Host IPv4 Address)

To test the local host IPv4 address:

1. Use ipconfig to display the host IP address. Note the IPv4 Address displayed.

2. Type ping <IPv4 Address> where <IPv4 Address> is the IPv4 address displayed above. For example, if the IPv4 address was 192.168.1.101, you would type ping 192.168.1.101. Then press Enter.

```
C:\Users\IT HOD> ping 192.168.1.101

Pinging 192.168.1.101 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.1.101:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\Users\IT HOD>ping 184.168.221.39

Pinging 184.168.221.39 with 32 bytes of data:
Reply from 184.168.221.39: bytes=32 time=319ms TTL=53
Reply from 184.168.221.39: bytes=32 time=319ms TTL=53
Reply from 184.168.221.39: bytes=32 time=319ms TTL=53
Reply from 184.168.221.39: bytes=32 time=319ms TTL=53

Ping statistics for 184.168.221.39:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 319ms, Maximum = 319ms, Average = 319ms

C:\Users\IT HOD>_
```

d).ping <hostname> (Ping the Host Name)

To test the local host name:

1. Use ipconfig /all to display the host name. Note the Host Name displayed.

2. Type ping <hostname> where <hostname> is the Host Name IPv4 address displayed above. For example, if the host name was host1, you would type ping host1. Then press Enter.

e) . ping < default gateway address> (Ping the Default Gateway)

1. Use ipconfig to display the default gateway address. Note the Default Gateway displayed.

2. Type ping <default gateway address> where <default gateway address> is the default gateway address displayed above. For example, if the default gateway address was 192.168.1.1, you would type ping 192.168.1.1. Then press Enter.

f). Ping an Internet Host by IPv4 Address

8.8.8.8 is the IPv4 address of one of Google's public DNS servers. To test Internet connectivity:

1. Type ping 8.8.8.8 and press Enter.

g). Ping an Internet Host by Name

google-public-dns-a.google.com is the host name of one of Google's public DNS servers. To test Internet connectivity with host name resolution:

1. Type ping google-public-dns-a.google.com and press Enter.

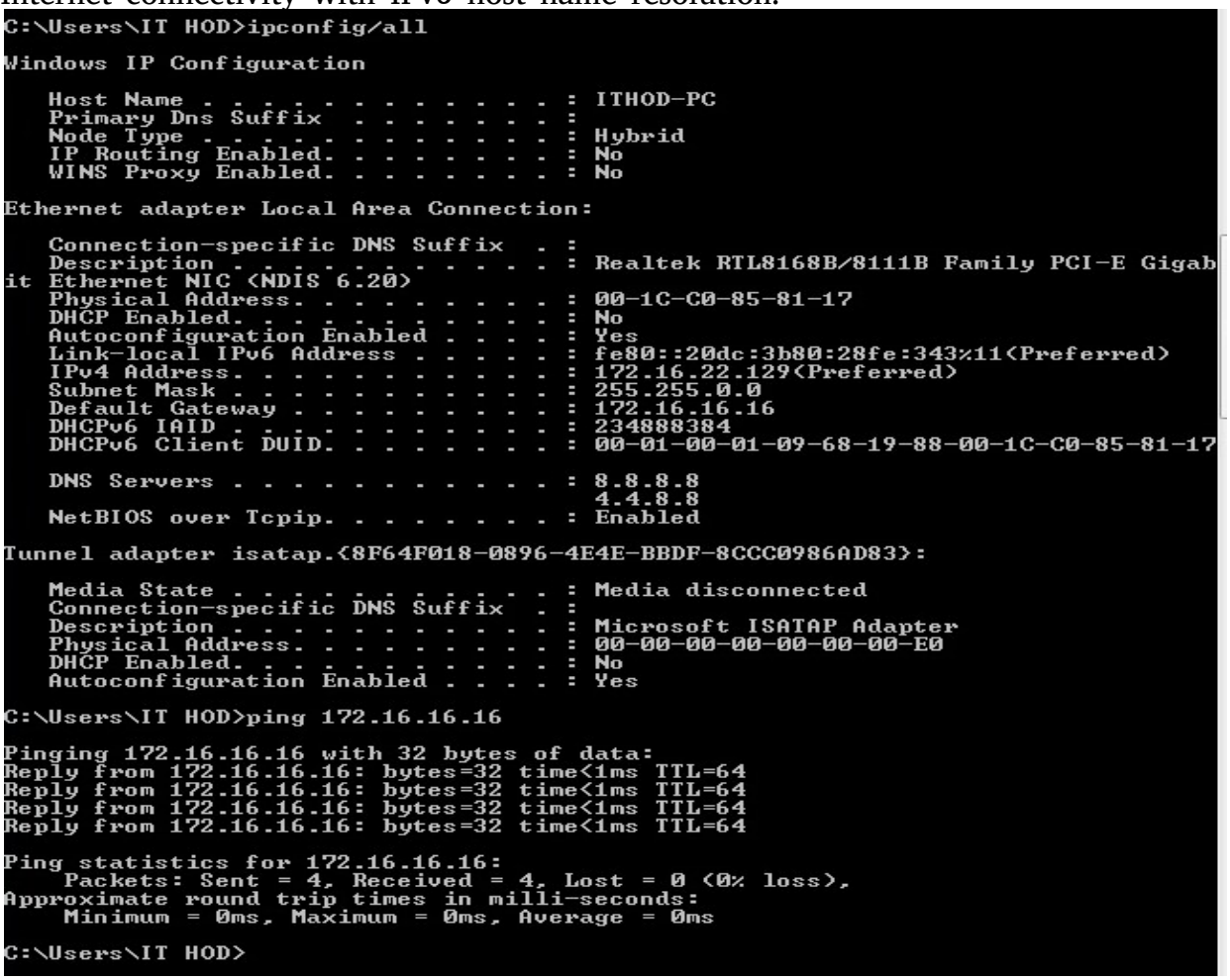
h). Ping an Internet Host by IPv6 Address

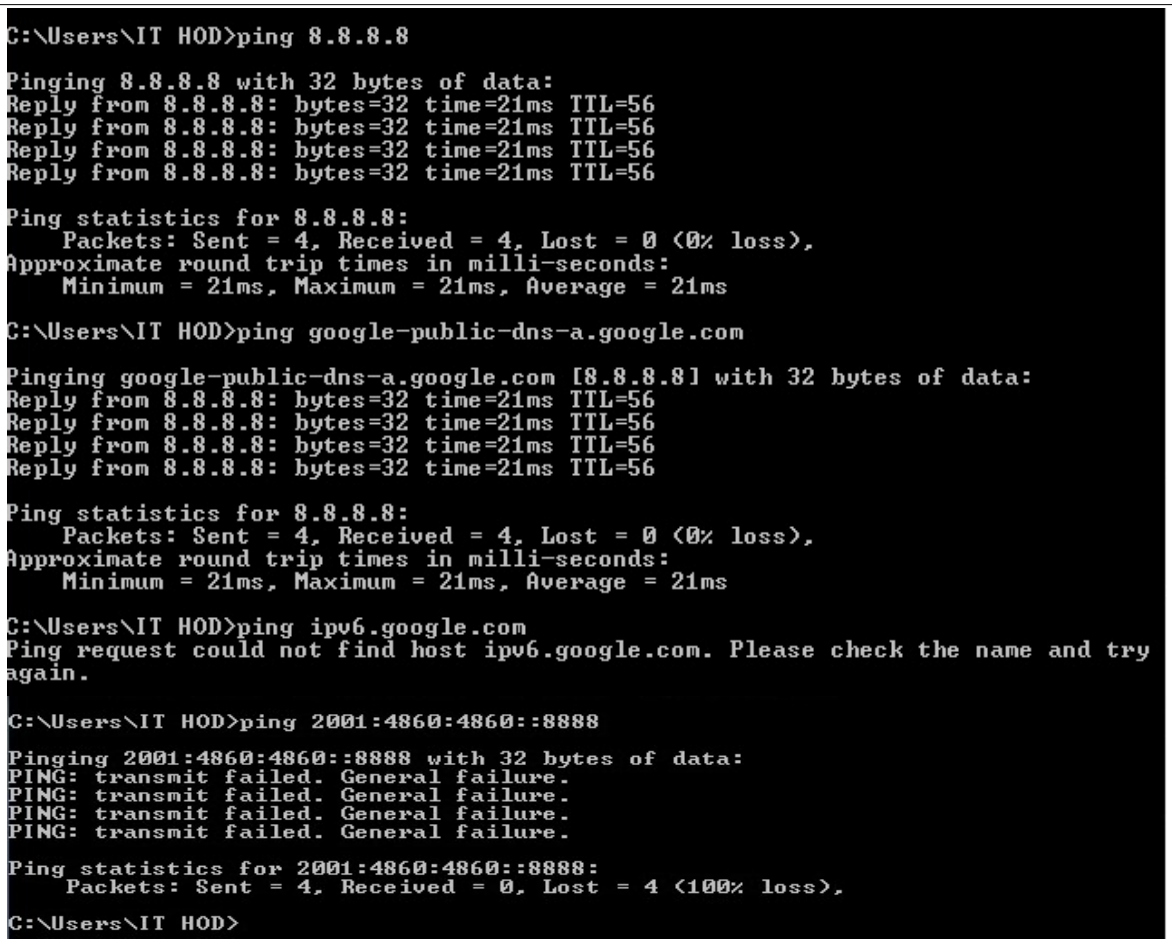
ipv6.google.com is the IPv6-only host name of Google's web servers. To test Internet connectivity with IPv6 host name resolution:

1. Type ping ipv6.google.com and press Enter.

i). Ping an Internet Host by IPv6 Name

ipv6.google.com is the IPv6-only host name of Google's web servers. To test Internet connectivity with IPv6 host name resolution:




C:\Users\IT HOD>ping 8.8.8.8
Pinging 8.8.8.8 with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=21ms TTL=56
Reply from 8.8.8.8: bytes=32 time=21ms TTL=56
Reply from 8.8.8.8: bytes=32 time=21ms TTL=56
Reply from 8.8.8.8: bytes=32 time=21ms TTL=56
Ping statistics for 8.8.8.8:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 21ms, Maximum = 21ms, Average = 21ms
C:\Users\IT HOD>ping google-public-dns-a.google.com
Pinging google-public-dns-a.google.com [8.8.8.8] with 32 bytes of data:
Reply from 8.8.8.8: bytes=32 time=21ms TTL=56
Reply from 8.8.8.8: bytes=32 time=21ms TTL=56
Reply from 8.8.8.8: bytes=32 time=21ms TTL=56
Reply from 8.8.8.8: bytes=32 time=21ms TTL=56
Ping statistics for 8.8.8.8:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 21ms, Maximum = 21ms, Average = 21ms
C:\Users\IT HOD>ping ipv6.google.com
Ping request could not find host ipv6.google.com. Please check the name and try again.
C:\Users\IT HOD>ping 2001:4860:4860::8888
Pinging 2001:4860:4860::8888 with 32 bytes of data:
PING: transmit failed. General failure.
PING: transmit failed. General failure.
PING: transmit failed. General failure.
PING: transmit failed. General failure.
Ping statistics for 2001:4860:4860::8888:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\Users\IT HOD>

RESULT:

Ex.No.2

HTTP WEB CLIENT PROGRAM TO DOWNLOAD A WEB PAGE USING TCP SOCKETS

AIM:

To Write a HTTP web client program to download a web page using TCP sockets.

ALGORITHM:

1. Start the program
2. Read the file to be downloaded from webpage
3. To download an image, use java URL class which can be found under java.net package.
4. The file is downloaded from server and is stored in the current working directory.
5. Stop the program

PROGRAM:

Download.java

```
import java.io.*;
import java.net.URL;
public class Download
{
 public static void main(String[] args) throws Exception
  {
    try
       {
       //String fileName = "Assessment_Schedule_ND19.pdf";
       //      String                                website                                =
"https://coe1.annauniv.edu/aucoe/pdf/2019_nd"+fileName;
       //      String fileName = "Rainbow_Rose_%283366550029%29.jpg";
       //String                                website                                =
"https://upload.wikimedia.org/wikipedia/commons/6/61/"+fileName;
       String fileName = "JPEG_example_JPG_RIP_100.jpg";
       String                                website                                =
"https://upload.wikimedia.org/wikipedia/commons/b/b4/"+fileName;
       System.out.println("Downloading File From: " + website);
       URL url = new URL(website);
       InputStream inputStream = url.openStream();
       OutputStream outputStream = new FileOutputStream(fileName);
       byte[] buffer = new byte[2048];
       int length = 0;
       while ((length = inputStream.read(buffer)) != -1)
```

```
        {
                System.out.println("Buffer Read of length: " + length);
                outputStream.write(buffer, 0, length);
        }
        inputStream.close();
        outputStream.close();
          }
        catch(Exception e)
        {
        System.out.println("Exception: " + e.getMessage());
        }
    }
}
```

OUTPUT:

RESULT:

Ex.No.3a **TCP - ECHO CLIENT AND ECHO SERVER**

AIM:

To write a program to implement an applications using TCP Sockets like echo client and echo server

ALGORITHM:

1. Start the Program
2. In Server
    a) Create a server socket and bind it to port.
    b) Listen for new connection and when a connection arrives, accept it.
    c) Read the data from client.
    d) Echo the data back to the client.
    e) Close all streams.
    f) Close the server socket.
    g) Stop.
3. In Client
    a) Create a client socket and connect it to the server's port number.
    b) Send user data to the server.
    c) Display the data echoed by the server.
    d) Close the input and output streams.
    e) Close the client socket.
    f) Stop.
4. Stop the program

PROGRAM:

SERVER:

```
#include<sys/socket.h>
#include<netinet/in.h>
#include<stdio.h>
#include<strings.h>
#define SERV_TCP_PORT 3785
int main(int argc,char *argv[])
```

```
{
int sockfd,new,clen;
struct sockaddr_in serv_add,cli_add;
char buffer[4096];
sockfd=socket(AF_INET,SOCK_STREAM,0);
serv_add.sin_family=AF_INET;
serv_add.sin_addr.s_addr=inet_addr("127.0.0.1");
serv_add.sin_port=htons(SERV_TCP_PORT);
bind(sockfd,(struct sockaddr*)&serv_add,sizeof(serv_add));
listen(sockfd,5);
clen=sizeof(cli_add);
new=accept(sockfd,(struct sockaddr*)&cli_add,&clen);
printf("ECHO SERVER connected...");
do
{
bzero(buffer,4096);
read(new,buffer,4096);
write(new,buffer,4096);
}while(strcmp(buffer,"bye\n")!=0);
close(sockfd);
return 0;
}
```

CLIENT:

```
#include<stdio.h>
#include<sys/types.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<strings.h>
#define SERV_TCP_PORT  3785
int main(int argc,char*argv[])
{
int sockfd;
struct sockaddr_in serv_add;
char buffer[4096];
sockfd=socket(AF_INET,SOCK_STREAM,0);
serv_add.sin_family=AF_INET;
serv_add.sin_addr.s_addr=inet_addr("127.0.0.1");
serv_add.sin_port=htons(SERV_TCP_PORT);
connect(sockfd,(struct sockaddr*)&serv_add,sizeof(serv_add));
do{
bzero(buffer,4096);
printf("\n Client:");
fgets(buffer,4096,stdin);
write(sockfd,buffer,4096);
bzero(buffer,4096);
read(sockfd,buffer,4096);
```

```
printf("\n Echo Server   Message:%s",buffer);
}while(strcmp(buffer,"bye\n")!=0);
close(sockfd);
return 0;
}
```

OUTPUT:

RESULT:

Ex.No.3b **TCP – CLIENT AND SERVER APPLICATION FOR CHAT**

AIM:

To write a program to implement a CHAT application using TCP Sockets.

ALGORITHM:

1. Start the Program
2. In Server
   a) Create a server socket and bind it to port.
   b) Listen for new connection and when a connection arrives, accept it.
   c) Read Client's message and display it
   d) Get a message from user and send it to client
   e) Repeat steps 3-4 until the client sends "end"
   f) Close all streams
   g) Close the server and client socket
   h) Stop
3. In Client
   a) Create a client socket and connect it to the server's port number
   b) Get a message from user and send it to server
   c) Read server's response and display it
   d) Repeat steps 2-3 until chat is terminated with "end" message
   e) Close all input/output streams
   f) Close the client socket
   g) Stop
4. Stop the program

PROGRAM:

SERVER:

```
#include<sys/socket.h>
#include<netinet/in.h>
#include<stdio.h>
#include<strings.h>
#define SERV_TCP_PORT 3771
int main(int argc,char*argv[])
{
```

```
int sockfd,new,clen;
struct sockaddr_in serv_add,cli_add;
char buffer[4096];
sockfd=socket(AF_INET,SOCK_STREAM,0);
serv_add.sin_family=AF_INET;
serv_add.sin_addr.s_addr=inet_addr("127.0.0.1");
serv_add.sin_port=htons(SERV_TCP_PORT);
bind(sockfd,(struct sockaddr*)&serv_add,sizeof(serv_add));
listen(sockfd,5);
clen=sizeof(cli_add);
new=accept(sockfd,(struct sockaddr*)&cli_add,&clen);
do
{
bzero(buffer,4096);
read(new,buffer,4096);
printf("\n Client message:%s",buffer);
bzero(buffer,4096);
printf("server:");
fgets(buffer,4096,stdin);
write(new,buffer,4096);
}
while(strcmp(buffer,"bye\n")!=0);
close(sockfd);
return 0;
}
```

CLIENT:

```
#include<stdio.h>
#include<sys/types.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<strings.h>
#define SERV_TCP_PORT 3771
int main(int argc,char*argv[])
{
int sockfd;
struct sockaddr_in serv_add;
char buffer[4096];
sockfd=socket(AF_INET,SOCK_STREAM,0);
serv_add.sin_family=AF_INET;
serv_add.sin_addr.s_addr=inet_addr("127.0.0.1");
serv_add.sin_port=htons(SERV_TCP_PORT);
connect(sockfd,(struct sockaddr*)&serv_add,sizeof(serv_add));
do{
bzero(buffer,4096);
printf("\n Client:");
fgets(buffer,4096,stdin);
```

```
write(sockfd,buffer,4096);
bzero(buffer,4096);
read(sockfd,buffer,4096);
printf("\n server Message:%s",buffer);
}
while(strcmp(buffer,"bye\n")!=0);
close(sockfd);
return 0;
}
```

OUTPUT:

RESULT:

Ex.No.3c **TCP - CLIENT AND SERVER FILE TRANSFER**

AIM:

To write a program to implement an applications using TCP Sockets like file transfer.

ALGORITHM:

1. Start the program
2. In Client side:
   a) Import all the necessary packages.
   b) Create a client socket and connect to server using port & IP address.
   c) Send a file request to server.
   d) Then server responses are retrieved using input & output streams.
   e) Close the socket.
3. At Server side:
   a) Import all the necessary packages.
   b) Create a client and server socket and accept client connection.
   c) Transfer file that user requested to transfer using output stream.
   d) Close the socket and trace the output.
4. Stop the program

PROGRAM

SERVER:

```
#include<stdio.h>
#include<unistd.h>
#include<string.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<sys/types.h>
#define SERV_PORT 3322
int main(int argc,char **argv)
{
int i,j;
ssize_t n;
FILE*fp;
char s[80],f[80];
```

```
struct sockaddr_in servaddr,cliaddr;
int listenfd,connfd,clilen;
listenfd=socket(AF_INET,SOCK_STREAM,0);
bzero(&servaddr,sizeof(servaddr));
servaddr.sin_family=AF_INET;
servaddr.sin_port=htons(SERV_PORT);
bind(listenfd,(struct sockaddr*)&servaddr,sizeof(servaddr));
listen(listenfd,1);
clilen=sizeof(cliaddr);
connfd=accept(listenfd,(struct sockaddr*)&cliaddr,&clilen);
printf("\n Client Connected");
read(connfd,f,80);
fp=fopen(f,"r");
printf("\nName of the requested file:%s",f);
printf("\nContent of the requested file\n");
while(fgets(s,80,fp)!=NULL)
{
printf("%s",s);
write(connfd,s,sizeof(s));
}
}
```

CLIENT:

```
#include<stdio.h>
#include<unistd.h>
#include<string.h>
#include<sys/socket.h>
#include<netinet/in.h>
#include<sys/types.h>
#define SERV_PORT 3322
int main(int argc,char **argv)
{
int i,j;
ssize_t n;
char filename[80],recvline[80];
struct sockaddr_in servaddr;
int sockfd;
sockfd=socket(AF_INET,SOCK_STREAM,0);
bzero(&servaddr,sizeof(servaddr));
servaddr.sin_family=AF_INET;
servaddr.sin_port=htons(SERV_PORT);
inet_pton(AF_INET,argv[1],&servaddr.sin_addr);
connect(sockfd,(struct sockaddr*)&servaddr,sizeof(servaddr));
printf("Enter the file name");
scanf("%s",filename);
write(sockfd,filename,sizeof(filename));
printf("\n Data of the file from server:\n");
```

```
while(read(sockfd,recvline,80)!=0)
{
puts(recvline);
}
}
```

OUTPUT:

RESULT:

Ex.No.4 **SIMULATION OF DNS USING UDP SOCKETS**

AIM:

To write a program to implement the DNS application using UDP Sockets.

ALGORITHM:

1. Start the Program
2. In Server
   a) Create an array of hosts and its ip address in another array
   b) Create a datagram socket and bind it to a port
   c) Create a datagram packet to receive client request
   d) Read the domain name from client to be resolved
   e) Lookup the host array for the domain name
   f) If found then retrieve corresponding address
   g) Create a datagram packet and send ip address to client
   h) Repeat steps 3-7 to resolve further requests from clients
   i) Close the server socket
   j) Stop
3. In Client
   a) Create a datagram socket
   b) Get domain name from user
   c) Create a datagram packet and send domain name to the server
   d) Create a datagram packet to receive server message
   e) Read server's response
   f) If ip address then display it else display "Domain does not exist"
   g) Close the client socket
   h) Stop
4. Stop the program

PROGRAM:

SERVER :

```
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
#include<sys/socket.h>
#include<sys/types.h>
#include<netinet/in.h>
#include<fcntl.h>
#include<arpa/inet.h>
int main()
{
int std,i,len,port;
char content[100],str[100];
char
```

```
ip[50][50]={"127.0.0.1","127.0.0.2","127.0.0.3","127.0.0.4","127.0.0.5"};
char eth[50][50]={"google","yahoo","rediff","rocket","hotmail"};
struct sockaddr_in ser,cli;
printf("\n Enter your port number");
scanf("%d",&port);
if((std=socket(AF_INET,SOCK_DGRAM,0))<0)
{
printf("\n Socket not created");
exit(0);
}
bzero((char*)&ser,sizeof(ser));
bzero((char*)&cli,sizeof(cli));
ser.sin_family=cli.sin_family=AF_INET;
ser.sin_port=cli.sin_port=htons(port);
ser.sin_addr.s_addr=cli.sin_addr.s_addr=htons(INADDR_ANY);
i=bind(std,(struct sockaddr*)&ser,sizeof(ser));
if(i<0)
{
printf("\n Connection problem\n");
exit(0);
}
len=sizeof(cli);
while(1)
{
printf("\n Received from client");
recvfrom(std,content,100,0,(struct sockaddr*)&cli,&len);
printf("%s/n",content);
if(strcmp(content,”bye”)==0)
break;
for(i=0;i<5;i++)
{
if(!strcmp(content,ip[i]))
{
strcpy(str,"");
printf("\n Received");
strcat(str,"ethernet name is:");
strcat(str,eth[i]);
sendto(std,str,100,0,(struct sockaddr*)&cli,len);
}
else
if(!strcmp(content,eth[i]))
{
strcpy(str,"");
printf("\n Received");
strcat(str,"IP address is:");
strcat(str,ip[i]);
sendto(std,str,100,0,(struct sockaddr*)&cli,len);
}
```

```
}
}
close();
return(0);
}
```

CLIENT:

```
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
#include<sys/socket.h>
#include<sys/types.h>
#include<netinet/in.h>
#include<fcntl.h>
int main()
{
int std,i,len,port;
char content[100];
struct sockaddr_in ser,cli;
printf("\n Enter your port number");
scanf("%d",&port);
if((std=socket(AF_INET,SOCK_DGRAM,0))<0)
{
printf("\n socket not created");
exit(0);
}
bzero((char*)&ser,sizeof(ser));
bzero((char*)&cli,sizeof(cli));
ser.sin_family=cli.sin_family=AF_INET;
ser.sin_port=cli.sin_port=htons(port);
ser.sin_addr.s_addr=cli.sin_addr.s_addr=htons(INADDR_ANY);
len=sizeof(ser);
for(;;)
{
printf("\n Enter ip address\n");
scanf("\n %s",content);
sendto(std,content,100,0,(struct sockaddr*)&ser,len);
printf("\n sent to server\n");
printf("%s\n",content);
if(strcmp(content,"bye")==0)
break;
recvfrom(std,content,100,0,(struct sockaddr*)&ser,&len);
printf("\nReceive from server\n");
printf("\n%s",content);
}
close(std);
return(0);
}
```

OUTPUT:

RESULT:

Ex.No.5 **WIRESHARK TOOL TO CAPTURE PACKETS**

AIM:

To Capture ping and traceroute PDUs using a network protocol analyzer and examine.

Network protocol analyzer - Wireshark

Wireshark is free & Open source network packet analyzer that is used for network analysis, troubleshooting, etc.

Wireshark, a network analysis tool formerly known as Ethereal, captures packets in real time and display them in human-readable format. Wireshark includes filters, color coding, and other features that let you dig deep into network traffic and inspect individual packets.

Installation on CentOS:

yum install gcc gcc-c++ bison flex libpcap-devel qt-devel gtk3-devel rpm-build libtool c-ares-devel qt5-qtbase-devel qt5-qtmultimedia-devel qt5-linguist desktop-file-utils

yum install wireshark wireshark-qt

yum install wireshark-gnome.

To Open Wireshark

Open directly or use the following commands

#su -root

wireshark

In wireshark filter icmp packets

In a konsole execute

ping www.sudo.com

traceroute www.google.com

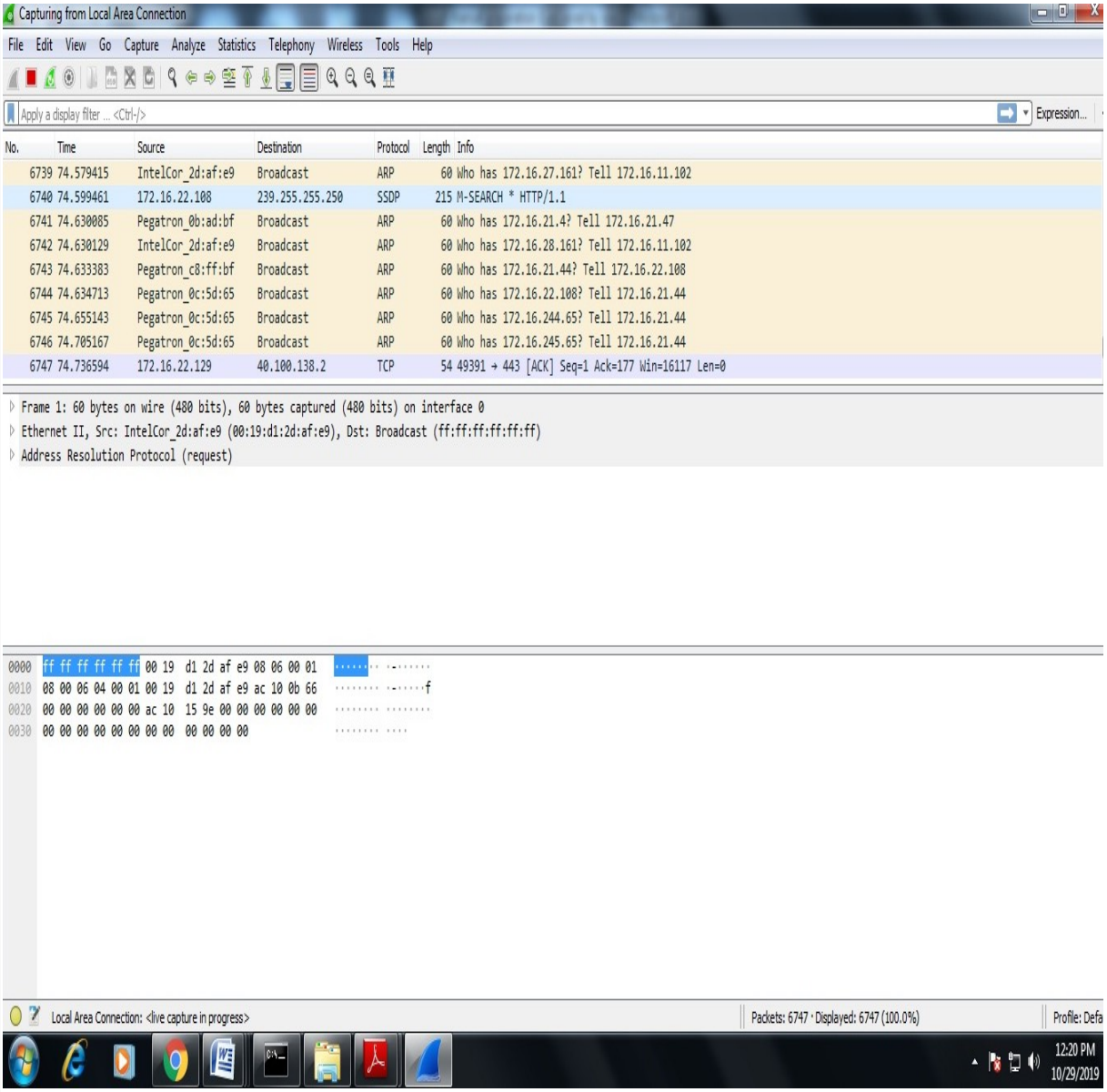
Installation on Windows:

1. Download the wireshark package for 32 bit – windows os.
2. Copy the downloaded package in the Program Files folder of C drive,
3. Execute the .exe file
4.

Testing Procedure:

Use Wireshark to Open the file for analysis (In Wireshark window)

1. File > Open > C:\perflogs > diagTraces0
2. Capture > options > select (choose or type) the filter type(tcp, udp ….)


Capturing from Local Area Connection
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>
Expression...
No. Time Source Destination Protocol Length Info
6739 74.579415 IntelCor_2d:af:e9 Broadcast ARP 60 Who has 172.16.27.161? Tell 172.16.11.102
6740 74.599461 172.16.22.108 239.255.255.250 SSDP 215 M-SEARCH * HTTP/1.1
6741 74.630085 Pegatron_0b:ad:bf Broadcast ARP 60 Who has 172.16.21.4? Tell 172.16.21.47
6742 74.630129 IntelCor_2d:af:e9 Broadcast ARP 60 Who has 172.16.28.161? Tell 172.16.11.102
6743 74.633383 Pegatron_c8:ff:bf Broadcast ARP 60 Who has 172.16.21.44? Tell 172.16.22.108
6744 74.634713 Pegatron_0c:5d:65 Broadcast ARP 60 Who has 172.16.22.108? Tell 172.16.21.44
6745 74.655143 Pegatron_0c:5d:65 Broadcast ARP 60 Who has 172.16.244.65? Tell 172.16.21.44
6746 74.705167 Pegatron_0c:5d:65 Broadcast ARP 60 Who has 172.16.245.65? Tell 172.16.21.44
6747 74.736594 172.16.22.129 40.100.138.2 TCP 54 49391 → 443 [ACK] Seq=1 Ack=177 Win=16117 Len=0
Frame 1: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0
Ethernet II, Src: IntelCor_2d:af:e9 (00:19:d1:2d:af:e9), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
Address Resolution Protocol (request)
0000 ff ff ff ff ff ff 00 19 d1 2d af e9 08 06 00 01
0010 08 00 06 04 00 01 00 19 d1 2d af e9 ac 10 0b 66
0020 00 00 00 00 00 00 ac 10 15 9e 00 00 00 00 00 00
0030 00 00 00 00 00 00 00 00 00 00 00 00
Local Area Connection: <live capture in progress>
Packets: 6747 · Displayed: 6747 (100.0%)
Profile: Defa
12:20 PM
10/29/2019

RESULT:

Ex.No.6 **SIMULATION OF ARP /RARP PROTOCOLS**

AIM:

To write a program to simulate ARP/RARP protocols.

ALGORITHM:

1. Start the Program
2. Enter the list of IP addresses and its corresponding MAC (Ethernet) addresses.
3. Perform the Address Translations.
   a. If ARP, then enter IP address it returns the corresponding MAC Address
   b. If RARP, then enter MAC address, it returns the corresponding IP address
4. Stop the program

PROGRAM:

```
#include<stdio.h>
#include<string.h>
int main()
{
int i,a,flag=0;
char
ip1[5][32]={"192.168.0.5","192.168.0.6","192.168.0.8","192.168.0.9"};
char
mac1[5]
[48]={"2c:41:38:9a:75:f5","2c:41:38:9a:75:f6","2c:41:38:9a:75:f7","2c:41:38:9a:75:f8","2c:
41:38:9a:75:f9"};
char ip[32],mac[48];
printf("\n The ARP table is \n");
printf("\n IP address\t MAC address");
for(i=0;i<5;i++)
{
printf("\n%s\t%s",ip1[i],mac1[i]);
}
printf("\n 1.ARP 2.RARP\n EXIT\n Enter your choice:");
scanf("%d",&a);
switch(a)
{
case 1:
printf("\n Enter Ip address:");
scanf("%s",&ip);
for(i=0;i<5;i++)
{
if(strcmp(ip,ip1[i])==0)
{
printf("\n mac addr is %s",mac1[i]);
printf("\n");
flag=1;
```

```
}
}
if(flag==0)
printf("\n Host not found in ARP table");
break;
case 2:
printf("\n Enter MAC address:");
scanf("%s",&mac);
for(i=0;i<5;i++)
{
if(strcmp(mac,mac1[i])==0)
{
printf("\n IP addr is %s",ip1[i]);
printf("\n");
flag=1;
}
}
if(flag==0)
printf("\n Host not found in ARP table");
break;
case 3:
printf("EXIT");
}
return 0;
}
```

OUTPUT:

RESULT:

Ex.No.7a

STUDY OF NETWORK SIMULATOR (NS)

AIM:

To Study the Network Simulator (NS) and the Simulation of Congestion Control Algorithms Using NS.

INTRODUCTION:

Network Simulator (Version 2), widely known as NS2, is simply an eventdriven simulation tool that has proved useful in studying the dynamic nature of communication networks. Simulation of wired as well as wireless network functions and protocols (e.g., routing algorithms, TCP, UDP) can be done using NS2. In general, NS2 provides users with a way of specifying such network protocols and simulating their corresponding behaviors. Due to its flexibility and modular nature, NS2 has gained constant popularity in the networking research community since its birth in 1989. Ever since, several revolutions and revisions have marked the growing maturity of the tool, thanks to substantial contributions from the players in the field. Among these are the University of California and Cornell University who developed the REAL network simulator, 1 the foundation which NS is based on.

Since 1995 the Defense Advanced Research Projects Agency (DARPA) supported development of NS through the Virtual InterNetwork Testbed (VINT) project currently the National Science Foundation (NSF) has joined the ride in development. Last but not the least, the group of Researchers and developers in the community are constantly working to keep NS2 strong and versatile.

BASIC ARCHITECTURE:

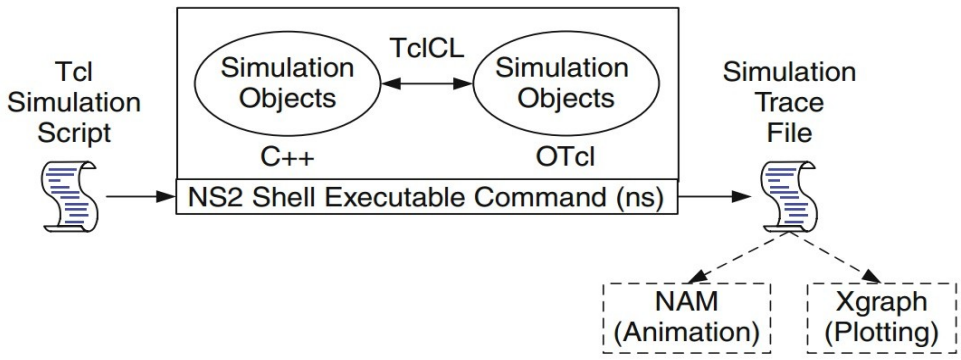


Fig. 2.1. Basic architecture of NS.

Figure shows the basic architecture of NS2. NS2 provides users with executable command ns which take on input argument, the name of a Tcl simulation scripting file. Users are feeding the name of a Tcl simulation script (which sets up a simulation) as an input argument of an NS2 executable command ns.

In most cases, a simulation trace file is created, and is used to plot graph and/or to create animation. NS2 consists of two key languages: C++ and Object-oriented Tool Command Language (OTcl). While the C++ defines the internal mechanism (i.e., a backend) of the simulation objects, the OTcl sets up simulation by assembling and configuring the objects as well as scheduling discrete events (i.e., a frontend).

The C++ and the OTcl are linked together using TclCL. Mapped to a C++ object, variables in the OTcl domains are sometimes referred to as handles. Conceptually, a handle (e.g., n as a Node handle) is just a string (e.g., _o10) in the OTcl domain, and does not contain any functionality. Instead, the functionality (e.g., receiving a packet) is defined in the mapped C++ object (e.g., of class Connector). In the OTcl domain, a handle acts as a frontend which interacts with users and other OTcl objects. It may define its own procedures and variables to facilitate the interaction. Note that the member procedures and variables in the OTcl domain are called instance procedures (instprocs) and instance variables (instvars), respectively. Before proceeding further, the readers are encouraged to learn C++ and OTcl languages.

NS2 provides a large number of built-in C++ objects. It is advisable to use these C++ objects to set up a simulation using a Tcl simulation script. However, advance users may find these objects insufficient. They need to develop their own C++ objects, and use a OTcl configuration interface to put together these objects. After simulation, NS2 outputs either text-based or animation-based simulation results. To interpret these results graphically and interactively, tools such as NAM (Network AniMator) and XGraph are used. To analyze a particular behavior of the network, users can extract a relevant subset of text-based data and transform it to a more conceivable presentation.

CONCEPT OVERVIEW

ns uses two languages because simulator has two different kinds of things it needs to do. On one hand, detailed simulations of protocols require a systems programming language which can efficiently manipulate bytes, packet headers and implement algorithms that run over large data sets. For these tasks run-time speed is important and turn-around time (run simulation, find bug, fix bug, recompile, re-run) is less important. On the other hand, a large part of network research involves slightly varying parameters or configurations, or quickly exploring number of scenarios.

In these cases, iteration time (change the model and re-run) is more important. Since configuration runs once (at the beginning of the simulation), run-time of this part of the task is less important. ns meets both of these needs with two languages, C++ and OTcl.

BASIC COMMANDS IN NS2

- Create event scheduler
    - **set ns [new Simulator]**
- Trace packets on all links
    - **set nf [open out.nam w]**
    - **$ns trace-all $nf**
    - **$ns namtrace-all $nf**
- Nodes
    - **set n0 [$ns node]**
    - **set n1 [$ns node]**
- Links and queuing
    - $ns duplex-link $n0 $n1 <bandwidth> <delay> <queue_type>
    - <queue_type>: DropTail, RED, etc.
    - **$ns duplex-link $n0 $n1 1Mb 10ms RED**

- Creating a larger topology

```
for {set i 0} {$i < 7} {incr i} {
set n($i) [$ns node]
}
for {set i 0} {$i < 7} {incr i} {
$ns duplex-link $n($i) $n([expr ($i+1)%7]) 1Mb 10ms RED
}
```

- Link failures
  - **$ns rtmodel-at <time> up|down $n0 $n1**
- Creating UDP connection
  - **set udp [new Agent/UDP]**
  - **set null [new Agent/Null]**
  - **$ns attach-agent $n0 $udp**
  - **$ns attach-agent $n1 $null**
  - **$ns connect $udp $null**

- Creating Traffic (On Top of UDP)
  - **set cbr [new Application/Traffic/CBR]**
  - **$cbr set packetSize_ 500**
  - **$cbr set interval_ 0.005**
  - **$cbr attach-agent $udp**
- Post-Processing Procedures

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

- Schedule Events
    - **$ns at <time> <event>**

- Call 'finish'
    - **$ns at 5.0 "finish"**
- Run the simulation
    - **$ns run**

INSTALLATION PROCEDURE FOR NS2:

1. Install winrar
2. Unzip NS2.35 Part-I (Extract here)
3. It creates a folder NS2.35. Open the folder and run the setup file.
    a. Click next
    b. Select Install from Local directory and click next
    c. Select Path C:\cygwin and click next
    d. In Select local package change the path as NS2.35\nslocal\release and click next
    e. Installation continues for 15 to 20 min
    f. Select Create icon on Desktop and Add icon to start menu and click finish.
4. Run cygwin from desktop and then close cygwin.
5. In C:\cygwin\home create a new folder in the name Noureddine
6. Now extract the file ns-allinone-2.35-RC7avecxgraph available in NS2.35. It creates a folder ns-allinone-2.35-RC7.
7. Copy the ns-allinone-2.35-RC7 folder and paste with in C:\cygwin\home\ Noureddine
8. Now copy the .bashrc file available in NS2.35 and paste in C:\cygwin\home\ admin by replacing the already existing .bashrc file
9. Open cygwin from desktop and execute the following commands:
    admin@admin-PC ~
    $ ns
    % ns-version
    2.35-RC6
    % exit
10. Copy NSG2.1 and nam-1.0a11a-win32 from NS2 Installation file and paste in desktop.

admin@admin-PC ~
$ cd ..
admin@admin-PC /home
$ cd ..

admin@admin-PC /
$ ls
Cygwin.bat Cygwin.ico sampleprogram bin cygdrive dev etc home lib opt proc tmp usr var
admin@admin-PC /
$ cd sampleprogram
admin@admin-PC /sampleprogram
$ns sample.tcl

RESULT:

Ex No. 7b SIMULATION OF CONGESTION CONTROL ALGORITHMS USING NS

AIM:

To study the simulation of Congestion Control Algorithm using NS2.

ALGORITHM:

1. Run NSG 2.1
2. Create two nodes n0 to n5.
3. Create a duplex-link and set the following parameters
    a. Queuetype : Droptail
    b. Capacity 0.2 Mbps
    c. Propagation delay: 200 ms
    d. Queue size: 10
4. Create link between the nodes n0 to n5.
    a. Set node no as source (Reno agent)
    b. Set node n4 as sink
5. In Application tab do the following.
    a. Application Type: ftp
    b. Start time: 1
    c. Stop time: 40
6. In parameters tab do the following
    a. Simulation time: 50
    b. Data record file: **congestion.xg**
    c. Click done
7. Click TCL and save the file as congestion.tcl in C:\cygwin\Sampleprogram
8. Run the congestion.tcl file
9. Verify the congestion.xg file using Xgraph command

PROGRAM:

```
#create simulator
set ns [new Simulator]
#to create nodes
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]
set n4 [$ns node]
set n5 [$ns node]
# to create the link between the nodes with bandwidth, delay and queue
$ns duplex-link $n0 $n2    2Mb   10ms DropTail
$ns duplex-link $n1 $n2    2Mb   10ms DropTail
$ns duplex-link $n2 $n3 0.3Mb 200ms DropTail
$ns duplex-link $n3 $n4 0.5Mb   40ms DropTail
$ns duplex-link $n3 $n5 0.5Mb   30ms DropTail
# Sending node is 0 with agent as Reno Agent
set tcp1 [new Agent/TCP/Reno]
$ns attach-agent $n0 $tcp1
# receiving (sink) node is n4
set sink1 [new Agent/TCPSink]
$ns attach-agent $n4 $sink1
# establish the traffic between the source and sink
$ns connect $tcp1 $sink1
# Setup a FTP traffic generator on "tcp1"
set ftp1 [new Application/FTP]
$ftp1 attach-agent $tcp1
$ftp1 set type_ FTP
# start/stop the traffic
$ns at 0.1    "$ftp1 start"
$ns at 40.0 "$ftp1 stop"
```

```
# Set simulation end time
$ns at 50.0 "finish"
# procedure to plot the congestion window
proc plotWindow {tcpSource outfile} {
   global ns
   set now [$ns now]
   set cwnd [$tcpSource set cwnd_]
# the data is recorded in a file called congestion.xg (this can be plotted # using xgraph or #gnuplot. this example uses xgraph to plot the cwnd_
   puts  $outfile  "$now $cwnd"
   $ns at [expr $now+0.1] "plotWindow $tcpSource  $outfile"
}
set outfile [open  "congestion.xg"  w]
$ns  at  0.0  "plotWindow $tcp1  $outfile"
proc finish {} {
       exec xgraph congestion.xg -geometry 300x300 &
   exit 0
}
# Run simulation
$ns run
```

OUTPUT:

RESULT:

Ex. No. 8 STUDY OF TCP/UDP PERFORMANCE USING SIMULATION TOOL

AIM:

To study the performance of TCP/UDP using simulation tool NS2.

ALGORITHM:

1. Create a simulator object
2. Define different colors for different data flows
3. Open a nam trace file and define finish procedure then close the trace file, and execute nam on trace file.
4. Create 4 number of nodes
5. Create duplex links between the nodes and set Queue size
6. Setup TCP connection between node no (Source) and n3 (Sink)
7. Apply FTP Traffic over TCP connection.
8. Setup UDP Connection between n1 and n3
9. Apply CBR Traffic over UDP connections
10. Schedule events (Start and Stop) for the TCP and UDP connections
11. Set the simulation time. And write command to print CBR packet size and CBR interval.
12. Run the program. Run the awk file to display the total number of dropped packets from out1.tr . Open and run the out.nam file.

Program:

```
#Create a simulator object
set ns [new Simulator]

#Define different colors for data flows (for NAM)
$ns color 1 Blue
$ns color 2 Red

#Open the NAM trace file
set nf [open out1.nam w]
$ns namtrace-all $nf

#Open the Trace file
set tf [open out1.tr w]
```

```
$ns trace-all $tf
#Define a 'finish' procedure
proc finish {} {
        global ns nf
        $ns flush-trace
        #Close the NAM trace file
        close $nf
        #Execute NAM on the trace file
        exec nam out.nam &
        exit 0
}
#Create four nodes
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]

#Create links between the nodes
$ns duplex-link $n0 $n2 2Mb 10ms DropTail
$ns duplex-link $n1 $n2 2Mb 10ms DropTail
$ns duplex-link $n2 $n3 1.7Mb 20ms DropTail

#Set Queue Size of link (n2-n3) to 10
$ns queue-limit $n2 $n3 10

#Give node position (for NAM)
$ns duplex-link-op $n0 $n2 orient right-down
$ns duplex-link-op $n1 $n2 orient right-up
$ns duplex-link-op $n2 $n3 orient right

#Monitor the queue for link (n2-n3). (for NAM)
$ns duplex-link-op $n2 $n3 queuePos 0.5

#Setup a TCP connection
set tcp [new Agent/TCP]
$tcp set class_ 2
$ns attach-agent $n0 $tcp
set sink [new Agent/TCPSink]
$ns attach-agent $n3 $sink
$ns connect $tcp $sink
$tcp set fid_ 1

#Setup a FTP over TCP connection
set ftp [new Application/FTP]
$ftp attach-agent $tcp
$ftp set type_ FTP
```

```
#Setup a UDP connection
set udp [new Agent/UDP]
$ns attach-agent $n1 $udp
set null [new Agent/Null]
$ns attach-agent $n3 $null
$ns connect $udp $null
$udp set fid_ 2

#Setup a CBR over UDP connection
set cbr [new Application/Traffic/CBR]
$cbr attach-agent $udp
$cbr set type_ CBR
$cbr set packet_size_ 1000
$cbr set rate_ 1mb
$cbr set random_ false

#Schedule events for the CBR and FTP agents
$ns at 0.1 "$cbr start"
$ns at 1.0 "$ftp start"
$ns at 4.0 "$ftp stop"
$ns at 4.5 "$cbr stop"

#Detach tcp and sink agents (not really necessary)
$ns at 4.5 "$ns detach-agent $n0 $tcp ; $ns detach-agent $n3 $sink"

#Call the finish procedure after 5 seconds of simulation time
$ns at 5.0 "finish"

#Print CBR packet size and interval
puts "CBR packet size = [$cbr set packet_size_]"
puts "CBR interval = [$cbr set interval_]"

#Run the simulation
$ns run

#Trace11.awk  program  (To disply the total number of dropped packets from trace file
BEGIN {
c=0;
}
{
if ($1=="d")
{
c++;
/*printf("%s\t%s\n",$5,$11);*/
}
}
```

```
END{
printf("The number of packets dropped =%d\n",c);
}
```

OUTPUT:

RESULT:

Ex.No.9.a SIMULATION OF DISTANCE VECTOR ROUTING ALGORITHM

AIM:

To perform the Simulation of Distance Vector Routing algorithm.

ALGORITHM:

1. Create a simulator object
2. Define different colors for different data flows
3. Open a nam trace file and define finish procedure then close the trace file, and execute nam on trace file.
4. Create 12 number of nodes using for loop
5. Create duplex links between the nodes
6. Setup UDP Connection between the nodes
7. Apply CBR Traffic over UDP connections
8. Choose distance vector routing protocol to transmit data from sender to receiver.
9. Schedule events and run the program.

PROGRAM (DISTANCE VECTOR PROTOCOL)

```
set ns [new Simulator]
set nr [open thro.tr w]
$ns trace-all $nr
set nf [open thro.nam w]
$ns namtrace-all $nf
proc finish { } {
global ns nr nf
 $ns flush-trace
close $nf
close $nr
exec nam thro.nam &
exit 0
 }
for { set i 0 } { $i < 12} { incr i 1 } {
```

```
set n($i) [$ns node]}
for {set i 0} {$i < 8} {incr i} {
$ns duplex-link $n($i) $n([expr $i+1]) 1Mb 10ms DropTail }


$ns duplex-link $n(0) $n(8) 1Mb 10ms DropTail
$ns duplex-link $n(1) $n(10) 1Mb 10ms DropTail
$ns duplex-link $n(0) $n(9) 1Mb 10ms DropTail
$ns duplex-link $n(9) $n(11) 1Mb 10ms DropTail
$ns duplex-link $n(10) $n(11) 1Mb 10ms DropTail
$ns duplex-link $n(11) $n(5) 1Mb 10ms DropTail

set udp0 [new Agent/UDP]
$ns attach-agent $n(0) $udp0

set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.005
$cbr0 attach-agent $udp0

set null0 [new Agent/Null]
$ns attach-agent $n(5) $null0
$ns connect $udp0 $null0

set udp1 [new Agent/UDP]
$ns attach-agent $n(1) $udp1

set cbr1 [new Application/Traffic/CBR]
$cbr1 set packetSize_ 500
$cbr1 set interval_ 0.005
$cbr1 attach-agent $udp1

set null0 [new Agent/Null]
$ns attach-agent $n(5) $null0
$ns connect $udp1 $null0

$ns rtproto DV

$ns rtmodel-at 10.0 down $n(11) $n(5)
$ns rtmodel-at 15.0 down $n(7) $n(6)
$ns rtmodel-at 30.0 up $n(11) $n(5)
$ns rtmodel-at 20.0 up $n(7) $n(6)
```

```
$udp0 set fid_ 1
$udp1 set fid_ 2
$ns color 1 Red
$ns color 2 Green
$ns at 1.0 "$cbr0 start"
$ns at 2.0 "$cbr1 start"
$ns at 45 "finish"
$ns run
```

OUTPUT:

RESULT:

Ex.No.9.b **SIMULATION OF LINK STATE ROUTING ALGORITHM**

AIM:

To perform the Simulation of Link State Routing algorithm.

ALGORITHM:

1. Create a simulator object
2. Define different colors for different data flows
3. Open a nam trace file and define finish procedure then close the trace file, and execute nam on trace file.
4. Create 12 number of nodes using for loop
5. Create duplex links between the nodes
6. Setup UDP Connection between the nodes
7. Apply CBR Traffic over UDP connections
8. Choose Link state routing protocol to transmit data from sender to receiver.
9. Schedule events and run the program.

PROGRAM (LINK STATE PROTOCOL)

```
set ns [new Simulator]
set nr [open link.tr w]
$ns trace-all $nr
set nf [open link.nam w]
$ns namtrace-all $nf
proc finish { } {
global ns nr nf
 $ns flush-trace
close $nf
close $nr
exec nam link.nam &
exit 0
 }
for { set i 0 } { $i < 12} { incr i 1 } {
```

```
set n($i) [$ns node]}


for {set i 0} {$i < 8} {incr i} {
$ns duplex-link $n($i) $n([expr $i+1]) 1Mb 10ms DropTail }
$ns duplex-link $n(0) $n(8) 1Mb 10ms DropTail
$ns duplex-link $n(1) $n(10) 1Mb 10ms DropTail
$ns duplex-link $n(0) $n(9) 1Mb 10ms DropTail
$ns duplex-link $n(9) $n(11) 1Mb 10ms DropTail
$ns duplex-link $n(10) $n(11) 1Mb 10ms DropTail
$ns duplex-link $n(11) $n(5) 1Mb 10ms DropTail

set udp0 [new Agent/UDP]
$ns attach-agent $n(0) $udp0

set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.005
$cbr0 attach-agent $udp0

set null0 [new Agent/Null]
$ns attach-agent $n(5) $null0
$ns connect $udp0 $null0

set udp1 [new Agent/UDP]
$ns attach-agent $n(1) $udp1

set cbr1 [new Application/Traffic/CBR]
$cbr1 set packetSize_ 500
$cbr1 set interval_ 0.005
$cbr1 attach-agent $udp1

set null0 [new Agent/Null]
$ns attach-agent $n(5) $null0
$ns connect $udp1 $null0

$ns rtproto LS
$ns rtmodel-at 10.0 down $n(11) $n(5)
$ns rtmodel-at 15.0 down $n(7) $n(6)
$ns rtmodel-at 30.0 up $n(11) $n(5)
$ns rtmodel-at 20.0 up $n(7) $n(6)

$udp0 set fid_ 1
$udp1 set fid_ 2
```

```
$ns color 1 Red
$ns color 2 Green

$ns at 1.0 "$cbr0 start"
$ns at 2.0 "$cbr1 start"
$ns at 45 "finish"
$ns run
```

OUTPUT:

RESULT:

Ex.No.10 SIMULATION OF ERROR CORRECTION CODE (LIKE CRC)

AIM:

To simulate the Cyclic Redundancy Code(CRC) encoder and decoder.

ALGORITHM:

1. Start the program.
2. Perform the CRC simulation.
   a. If CRC Encoder, enter the dataword length, dataword, the divisor length and divisor.
      1. Concatenate the dataword with (divisor length -1) number of zeros.
      2. Perform modulo2 division (i.e step 1 result divided by divisor).
      3. (divisor length -1) number of remainder Least significant digits is considered to be CRC. The codeword is generated by concatenating the dataword with CRC.
   b. If CRC Decoder, enter the codeword length, codeword, the divisor length and divisor.
      1. Perform modulo2 division(i.e codeword divided by divisor)
      2. If the remainder is zero, then the received codeword has no error. Otherwise the received codeword has error.
3. Stop the program

PROGRAM:

```
#include<stdio.h>
int * mod2div(int n[], int div[], int clength, int divlength);
int f[20];
void main()
{
int j,i,a,temp2,clength,dlength,divlength,c[20],n[20],div[50];
 a=temp2=0;
int *f;

printf("\n 1.CRC ENCODER 2.CRC DECODER \n EXIT\n Enter your choice:");
scanf("%d",&a);
switch(a)
{
case 1:
```

```
printf("enter the length of dataword\n");
scanf("%d",&dlength);

printf("enter the data word\n");
for(i=0;i<dlength;i++)
{
scanf("%d",&n[i]);
}
for(i=0;i<dlength;i++)
{
c[i]=n[i];
}
printf("enter the length of divisor\n");
scanf("%d",&divlength);
printf("enter the divisor\n");
for(i=0;i<divlength;i++)
{
scanf("%d",&div[i]);
}
clength=dlength+divlength-1;
for(i=dlength;i<clength;i++)
{
n[i]=0;
}
printf("\nthe data with zeros is \n");
for(i=0;i<clength;i++)
printf("%d",n[i]);
f=mod2div(n,div,clength,divlength);
for(i=dlength;i<clength;i++)
{
c[i]=n[i];
}
printf("\n The codeword is \n ");
for(i=0;i<clength;i++)
{
printf("%d",c[i]);
}
break;
case 2:
printf("enter the length of codeword\n");
scanf("%d",&clength);
printf("enter the code word\n");
for(i=0;i<clength;i++)
{
scanf("%d",&n[i]);
}
printf("enter the length of divisor\n");
scanf("%d",&divlength);
```

```
printf("enter the divisor\n");
for(i=0;i<divlength;i++)
{
scanf("%d",&div[i]);
}
f=mod2div(n,div,clength,divlength);
for(j=0;j<divlength;j++)
{
 temp2=temp2+f[j];
 }
if(temp2==0)
printf("\n No error in received code");
else
printf("\n error occurs in received code");
break;
case 3:
printf("EXIT");
}
return 0;
}
// function description mod2div
int * mod2div(int n[], int div[], int clength, int divlength)
{
int i,M,temp,dlength,j,quot[20];
dlength=clength-divlength+1;

for(i=0;i<dlength;i++)
{
temp=i;
if(n[i]==1)
{
quot[i]=1;
for (j=0;j<divlength;j++)
{
M=n[temp] ∧ div[j];
n[temp]=f[j]=M;
temp=temp+1;
}
}
else
{
quot[i]=0;
for(j=0;j<divlength;j++)
f[j]=n[i+j];
}
}
printf("\n and the quotient is \n ");
for(j=0;j<dlength;j++)
```

```
printf("%d",quot[j]);

printf("\n and the remainder is \n ");
for(j=0;j<divlength;j++)
printf("%d",f[j]);
return f;
}
```

OUTPUT:

RESULT: