Module – 5

NS2 Simulator

Experiment – 01

Four Node Point to Point Network

TCL file :

Handwritten page:
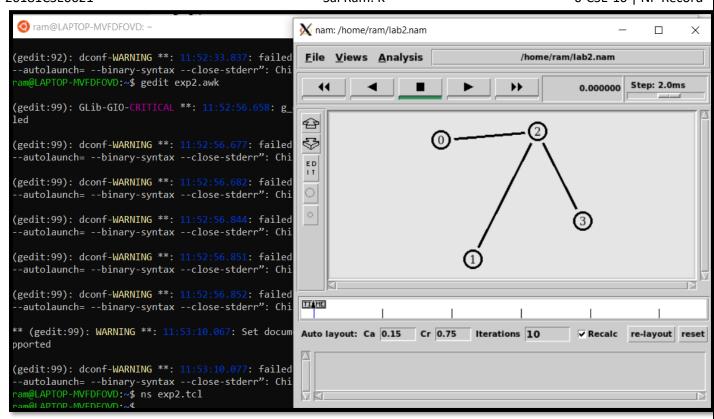
MODULE-5
NS2 SIMULATOR

EXPERIMENT-01
THREE NODE POINT TO POINT NETWORK.

→ AIM: To simulate a three node point to point network with duplex links between them. Set queue size and vary the bandwidth and find number of packets dropped.

• TCL file:

```
Set ns [new Simulator]
Set nf [open PA1.nam w]
$ns namtrace-all $tf
proc finish {} {
    global ns nf tf
$ns flush-trace
close $nf
close $tf
exec nam PA1.nam &
exit 0
}
Set n0 [$ns node]
Set n2 [$ns node]
$ns duplex-link $n0 $n2 200mb 10ms DropTail
$ns duplex-link $n2 $n3 1mb 1000ms DropTail
$ns queue-limit $n0 $n2 10
Set udp0 [new Agent/UDP]
$ns attach-agent $n0 $udp0
set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_500
```
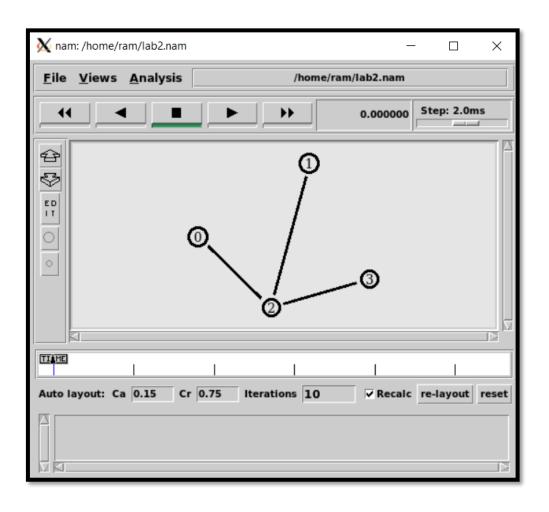
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AWK file: -

```
$cbr0 set_interval_0.005
$cbr0 attach-agent $udp0
set null 0 [new Agent/NULL]
$ns attach agent $n3 $null0
$ns connect $udp0 $null0
$ns at 0.1 "$cbr0 start"
$ns at 1.0 "finish"
$ns run.
```

→ Awk file:

```awk
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

exp2.tcl

```
set ns [new Simulator]
set nf [open lab2.nam w]
$ns namtrace-all $nf
set tf [open lab2.tr w]
$ns trace-all $tf
proc finish { } {
global ns nf tf
$ns flush-trace
close $nf
close $tf
exec nam lab2.nam &
exit 0
}
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]
$ns duplex-link $n0 $n2 10Mb 1ms DropTail
$ns duplex-link $n1 $n2 10Mb 1ms DropTail
$ns duplex-link $n2 $n3 10Mb 1ms DropTail
set tcp0 [new Agent/TCP]
$ns attach-agent $n0 $tcp0
set udp1 [new Agent/UDP]
$ns attach-agent $n1 $udp1
set null0 [new Agent/Null]
$ns attach-agent $n3 $null0
set sink0 [new Agent/TCPSink]
$ns attach-agent $n3 $sink0
set ftp0 [new Application/FTP]
$ftp0 attach-agent $tcp0
set cbr1 [new Application/Traffic/CBR]
$cbr1 attach-agent $udp1
$ns connect $tcp0 $sink0
$ns connect $udp1 $null0
$ns at 0.1 "$cbr1 start"
$ns at 0.2 "$ftp0 start"
$ns at 0.5 "finish"
$ns run
```
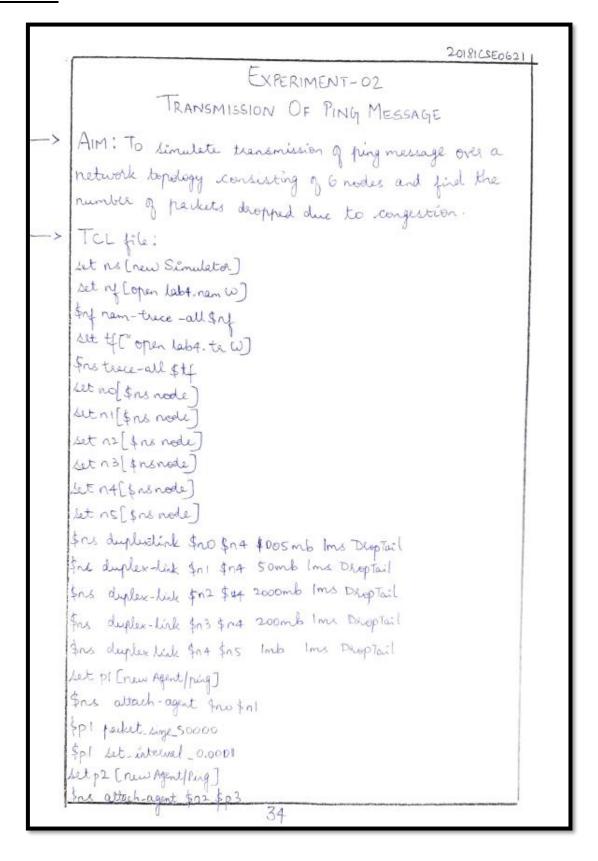
exp2.awk

```
BEGIN{
udp=0;
tcp=0;
}
{
if($1= = "r" && $5 = = "cbr")
{
udp++;
}
else if($1 = = "r" && $5 = = "tcp")
{
tcp++;
}
}
END{
printf("Number of packets sent by TCP = %d\n", tcp); printf("Number of packets sent by
UDP=%d\n",udp);
}
```

Experiment – 2

Transmission of Ping Message

TCL File: -

```
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                    EXPERIMENT-02
            TRANSMISSION OF PING MESSAGE

→  AIM: To simulate transmission of ping message over a
   network topology consisting of 6 nodes and find the
   number of packets dropped due to congestion.

→  TCL file:
   set ns [new Simulator]
   set nf [open lab4.nam w]
   $nf nam-trace -all $nf
   set tf [" open lab4.tr w]
   $ns trace-all $tf
   set n0 [$ns node]
   set n1 [$ns node]
   set n2 [$ns node]
   set n3 [$ns node]
   set n4 [$ns node]
   set n5 [$ns node]
   $ns duplex-link $n0 $n4 $005mb 1ms DropTail
   $ns duplex-link $n1 $n4 50mb 1ms DropTail
   $ns duplex-link $n2 $n4 2000mb 1ms DropTail
   $ns duplex-link $n3 $n4 200mb 1ms DropTail
   $ns duplex-link $n4 $n5 1mb 1ms DropTail
   set p1 [new Agent/ping]
   $ns attach-agent $n0 $n1
   $p1 packet_size_50000
   $p1 set_interval_0.0001
   set p2 [new Agent/Ping]
   $ns attach-agent $n2 $p3
```

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```
$p3 set packetSize _ 30000
$p3 set-interval-0.00001
set p4 [new Agent/Ping]
ns attach-agent $n3 $p4
set p5 [new Agent/Ping]
$ns queue limit $n0 $n4 5
$ns queue limit $n2 $n4 3
$ns queue limit $n4 $n5 2
Agent/Ping instproc recv {from rtt} {
$self instvar node_
puts "node [$node_id] from $from with $rtt msec.
$ns connect $p1 $p5
$ns connect $p3 $p4
proc finish {} {
global ns tf nf
$ns flush-trace
close $nf
close $tf
exec nam lab4.nam &
exit 0
}

$ns at 0.1 "$p1 send"
$ns at 0.2 "$p1 send"
        :
$ns at 0.9 "$p1 send"
$ns at 1.0 "$p1 send"
$ns at 1.1 "$p1 send"
        :
$ns at 1.9 "$p1 send"
```

```
$ns at 2.0 "$p3 send"
$ns at 2.1 "$p3 send"
   :
$ns at 2.9 "$p3 send"
$ns at 0.1 "p3 send"
   :
$ns at 0.9 "p3 send"
$ns at 1.0 "p3 send"
$ns at 1.1 "p3 send"
   :
$ns at 2.0 "p3 send"
$ns at 2.1 "p3 send"
   :
$ns at 2.9 "p3 send"
$ns at 3.0 "finish"
$ns run
```

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AWK File: -

```awk
AWK file:
BEGIN{
drop=0;
}{
    if($1=="d")
    {
     drop++;
    }
    END{
    printf("Total %s packets dropped: %d\n", $5, drop);
    }
```
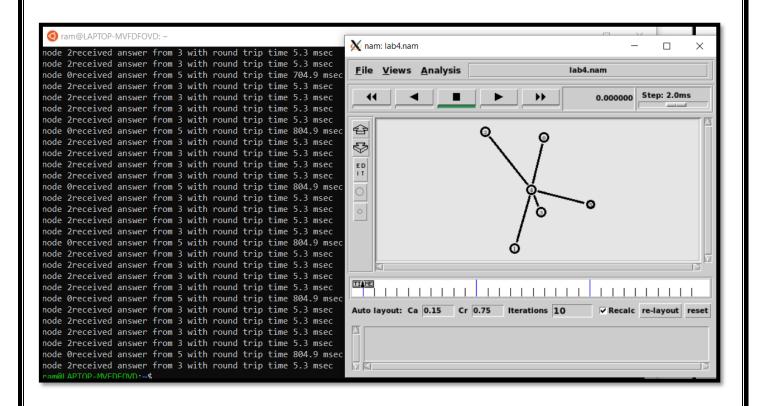
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OUTPUT

TCL

```tcl
set ns [ new Simulator ]
set nf [ open lab4.nam w ]
$ns namtrace-all $nf
set tf [ open lab4.tr w ]
$ns trace-all $tf
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]
set n4 [$ns node]
set n5 [$ns node]
$ns duplex-link $n0 $n4 1005Mb 1ms DropTail
$ns duplex-link $n1 $n4 50Mb 1ms DropTail
$ns duplex-link $n2 $n4 2000Mb 1ms DropTail
$ns duplex-link $n3 $n4 200Mb 1ms DropTail
$ns duplex-link $n4 $n5 1Mb 1ms DropTail
set p1 [new Agent/Ping]
$ns attach-agent $n0 $p1
$p1 set packetSize_ 50000
$p1 set interval_ 0.0001
set p2 [new Agent/Ping]
$ns attach-agent $n1 $p2
set p3 [new Agent/Ping]
$ns attach-agent $n2 $p3
$p3 set packetSize_ 30000
$p3 set interval_ 0.00001
set p4 [new Agent/Ping]
$ns attach-agent $n3 $p4
set p5 [new Agent/Ping]
$ns attach-agent $n5 $p5
$ns queue-limit $n0 $n4 5
$ns queue-limit $n2 $n4 3
$ns queue-limit $n4 $n5 2
Agent/Ping instproc recv {from rtt} {
$self instvar node_
puts "node [$node_ id]received answer from $from with round trip time $rtt msec" }

$ns connect $p1 $p5
$ns connect $p3 $p4
```

```tcl
$ns at 2.1 "$p1 send"
$ns at 2.2 "$p1 send"
$ns at 2.3 "$p1 send"
$ns at 2.4 "$p1 send"
$ns at 2.5 "$p1 send"
$ns at 2.6 "$p1 send"
$ns at 2.7 "$p1 send"
$ns at 2.8 "$p1 send"
$ns at 2.9 "$p1 send"
$ns at 0.1 "$p3 send"
$ns at 0.2 "$p3 send"
$ns at 0.3 "$p3 send"
$ns at 0.4 "$p3 send"
$ns at 0.5 "$p3 send"
$ns at 0.6 "$p3 send"
$ns at 0.7 "$p3 send"
$ns at 0.8 "$p3 send"
$ns at 0.9 "$p3 send"
$ns at 1.0 "$p3 send"
$ns at 1.1 "$p3 send"
$ns at 1.2 "$p3 send"
$ns at 1.3 "$p3 send"
$ns at 1.4 "$p3 send"
$ns at 1.5 "$p3 send"
$ns at 1.6 "$p3 send"
$ns at 1.7 "$p3 send"
$ns at 1.8 "$p3 send"
$ns at 1.9 "$p3 send"
$ns at 2.0 "$p3 send"
$ns at 2.1 "$p3 send"
$ns at 2.2 "$p3 send"
$ns at 2.3 "$p3 send"
$ns at 2.4 "$p3 send"
$ns at 2.5 "$p3 send"
$ns at 2.6 "$p3 send"
$ns at 2.7 "$p3 send"
$ns at 2.8 "$p3 send"
$ns at 2.9 "$p3 send"
$ns at 3.0 "finish"
$ns run
```

AWK

```awk
BEGIN{
drop=0;
}
{
if($1=="d")
{
drop++;
}
}
END{
printf("Total number of %s packets dropped due to congestion =%d\n",$5,drop);
}
```

Experiment – 3

Ethernet LAN using N-Nodes

TCL File: -

```
                                                    20181CSE0621
                        EXPERIMENT-03
ETHERNET LAN USING n nodes and set multiple
traffic nodes and plot congestion window.

AIM : To simulate an Ethernet LAN using n nodes and set
multiple traffic nodes and plot congestion window for
different source/destination.

TCL file:-
Set ns [new Simulator]
set tf [open p7. tr w]
$ns trace-all $tf
set nf [open p7.nam w]
$nam trace-all $nf
Set n0 [$ns node]
$n0 color "magenta"
$n0 label "src1"
Set n1 [$ns node]
set n2 [$ns node]
$n2 color "magenta"
$n2 label "src 2"
set n3 [$ns node]
$n3 color "blue"
$n3 label "dest2"
set n4 [$ns node]
set n5 [$ns node]
$n5 color "blue"
$n5 label "dest1"
$ns make-lan "$n0 $n1 $n2 $n3 $n4" 100mb 100ms LL Queue/DropTail MAC/802_3
                            37
```

```
$ns duplex-link $n4 $n5 1mb 1ms DropTail
set tcp0 [new Agent/TCP]
$ns attach-agent $n0 $tcp0
set ftp0 [new Application/TCP]
$ ftp0 attach-agent tcp0
$ ftp0 set packet-size 500
$ ftp set interval 0.0001
set sink5 [new Agent/TCPSink]
$ns attach-agent $n5 $sink5
set tcp2 [new Agent/TCP]
$ns attach-agent $n2 $tcp2
set ftp2 [new Application/FTP]

$tcp2 attach $file2
$tcp0 trace cwnd
cwnd
proc finish{} {
 global ns nf tf
$ns flush-trace
close $tf
close $nf
exec nam p7.nam &
exit 0
}
```

```
$ns at 0.1 "$ftp0 start"
$ns at 5   "$ftp0 stop"
$ns at 7   "$ftp0 start"
$ns at 0.2 "$ftp2 start"
$ns at 8   "$ftp2 stop"
$ns at 14  "$ftp0 stop"
$ns at 10  "$ftp2 start"
$ns at 15  "$ftp2 stop"
$ns at 16  "finish"
$ns run.
```

AWK File: -

```
AWK file:
BEGIN {
  {
    if ($6 == "cwnd_")
    printf("%f\t %f\t \n", $1, $7);
  }
  END{
  }
```
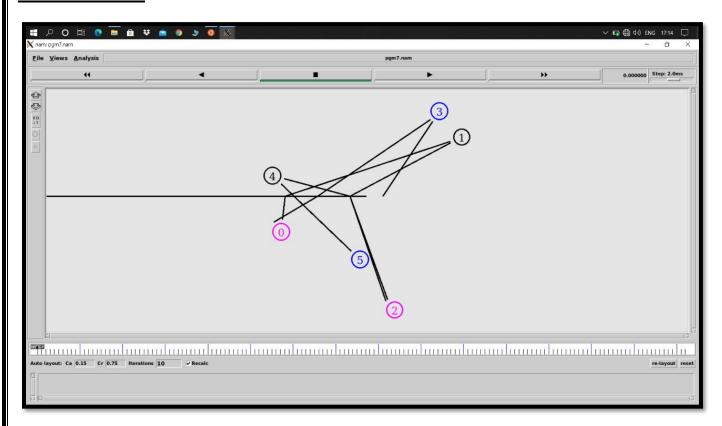
OUTPUT

TCL

```
set ns [new Simulator]
set tf [open pgm7.tr w]
$ns trace-all $tf
set nf [open pgm7.nam w]
$ns namtrace-all $nf
set n0 [$ns node]
$n0 color "magenta"
$n0 label "src1"
set n1 [$ns node]
set n2 [$ns node]
$n2 color "magenta"
$n2 label "src2"
set n3 [$ns node]
$n3 color "blue"
$n3 label "dest2"
set n4 [$ns node]
set n5 [$ns node]
$n5 color "blue"
$n5 label "dest1"
$ns make-lan "$n0 $n1 $n2 $n3 $n4" 100Mb 100ms LL Queue/ DropTail Mac/802_3

$ns duplex-link $n4 $n5 1Mb 1ms DropTail
set tcp0 [new Agent/TCP]
$ns attach-agent $n0 $tcp0
set ftp0 [new Application/FTP]
$ftp0 attach-agent $tcp0
$ftp0 set packetSize_ 500
$ftp0 set interval_ 0.0001
set sink5 [new Agent/TCPSink]
$ns attach-agent $n5 $sink5
$ns connect $tcp0 $sink5
set tcp2 [new Agent/TCP]
$ns attach-agent $n2 $tcp2
set ftp2 [new Application/FTP]
$ftp2 attach-agent $tcp2
$ftp2 set packetSize_ 600
$ftp2 set interval_ 0.001
set sink3 [new Agent/TCPSink]
$ns attach-agent $n3 $sink3
$ns connect $tcp2 $sink3
```

`exp5.tcl ~/` — `Open` `Save` — Tcl ▾ Tab Width: 8 ▾ Ln 21, Col 1 INS

```
set sink5 [new Agent/TCPSink]
$ns attach-agent $n5 $sink5
$ns connect $tcp0 $sink5
set tcp2 [new Agent/TCP]
$ns attach-agent $n2 $tcp2
set ftp2 [new Application/FTP]
$ftp2 attach-agent $tcp2
$ftp2 set packetSize_ 600
$ftp2 set interval_ 0.001
set sink3 [new Agent/TCPSink]
$ns attach-agent $n3 $sink3
$ns connect $tcp2 $sink3
set file1 [open file1.tr w]
$tcp0 attach $file1
set file2 [open file2.tr w]
$tcp2 attach $file2
$tcp0 trace cwnd_
proc finish { } {
global ns nf tf
$ns flush-trace
close $tf
close $nf
exec nam pgm7.nam &
exit 0
}
$ns at 0.1 "$ftp0 start"
$ns at 5 "$ftp0 stop"
$ns at 7 "$ftp0 start"
$ns at 0.2 "$ftp2 start"
$ns at 8 "$ftp2 stop"
$ns at 14 "$ftp0 stop"
$ns at 10 "$ftp2 start"
$ns at 15 "$ftp2 stop"
$ns at 16 "finish"
$ns run
```

AWK

Simulation:

Experiment – 4

Simple ESS With Wireless LAN

TCL File: -

EXPERIMENT-04

SIMPLE ESS WITH WIRELESS LAN.

AIM : To simulate simple ESS with transmitting nodes in wireless LAN.

TCL file:

```
set ns [new Simulator]
set tf [open lab8.tr w]
$ns trace-all $tf
set topo [new topography]
$topo load_flatgrid 1000 1000
set nf [open lab8.nam w]
$ns namtrace-all-wireless $nf 1000 1000
$ns node-config  -adhocRouting DSDV\
-llType LL
-macType Mac/802-11\
-if qType queue /DropTail
-if qlen 50\
-phyType Phy/Wireless Phy\
-chanelType /Wireless channel\
-antType antenna /Omni Antenna
-TopoInstance $topo\
-agentTrace ON\
-routerTrace ON
create-god 3
set n0[$ns node]
set n1[$ns node]
set n2[$ns node]
$n0 label "tcp"
$n1 label "sink-1/tcp1"
```

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```
$n0 set X_50
$n0 set Y_50
$n1 set X_100
$n1 set Y-100
$n2 set X_600
$n2 set Y_600
$n0 set Z_0
$n1 set Z_0
$n2 set Z_0
$ns at 0.1 "$n0 setdest 50 50 15"
$ns at 0.1 "$n1 setdest 100 100 25"
$ns at 0.1 "$n2 setdest 600 600 25"
set tcp0 [new Agent/TCP]
$ns attach-agent $n0 $tcp0
set ftp0 [new-Application/FTP]
$ns connect $tcp0 $sink1
set tcp1 [new Agent/TCP]
$ns attach-agent $1 $tcp1
set ftp1 [new-Application/FTP]
$ftp 1 attach-agent $tcp1
set sink2 [new-Agent/TCPSink]
$ns attach-agent $n2 $sink2
$ns at 5 "$ftp0 start"
$ns at 5 "$ftp1 start"
$ns at 100 "$n1 setdest 550 550 15"
$ns at 190 "$n1 setdest 70 70 15"
proc finish {} {
  global ns nf tf
  $ns flush-trace
  exec nam lab8.nam &
  close $tf
  exit 0
}
$ns at 250 "finish"
$ns run
```

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AWK File: -

```
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AWK File :

BEGIN {
    count 1 = 0
    count 2 = 0
    pack 1 = 0
    pack 2 = 0
    time 1 = 0
    time 2 = 0
}

{
    if ($1 == "r" && $3 == "1" && $4 == "AGT")
    {   count 1++
        pack 1 = pack1 + $8
        time 1 = $2
    }
    if ($1 == "r" && $3 == "2" && $4 = "AGT")
    {   count2 ++
        pack 2 = pack2 + $8
        time 2 = $2
    }
}

END {
printf (" Throughput from n0 to n1: %f mbps \n",
        (((count1 * pack 1 * 8) / (time1 * 1000000)));

printf (" Throughput from n1 to n2 : %f mbps \n",
        (((count2 * pack2 * 8) / (time2 * 1000000)));
}
```

OUTPUT

TCL

```tcl
#20181CSE0621
set ns [new Simulator]
set tf [open lab8.tr w]
$ns trace-all $tf
set topo [new Topography]
$topo load_flatgrid 1000 1000
set nf [open lab8.nam w]
$ns namtrace-all-wireless $nf 1000 1000
$ns node-config -adhocRouting DSDV \
-llType LL \
-macType Mac/802_11 \
-ifqType Queue/DropTail \
-ifqLen 50 \
-phyType Phy/WirelessPhy \
-channelType Channel/WirelessChannel \
-prrootype Propagation/TwoRayGround \
-antType Antenna/OmniAntenna \
-topoInstance $topo \
-agentTrace ON \
-routerTrace ON
create-god 3
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
$n0 label "tcp0"
$n1 label "sink1/tcp1"
$n2 label "sink2"
$n0 set X_ 50
$n0 set Y_ 50
$n0 set Z_ 0
$n1 set X_ 100
$n1 set Y_ 100
$n1 set Z_ 0
$n2 set X_ 600
$n2 set Y_ 600
$n2 set Z_ 0
$ns at 0.1 "$n0 setdest 50 50 15"
$ns at 0.1 "$n1 setdest 100 100 25"
$ns at 0.1 "$n2 setdest 600 600 25"
set tcp0 [new Agent/TCP]
```

```tcl
set sink1 [new Agent/TCPSink]
$ns attach-agent $n1 $sink1
$ns connect $tcp0 $sink1
set tcp1 [new Agent/TCP]
$ns attach-agent $n1 $tcp1
set ftp1 [new Application/FTP]
$ftp1 attach-agent $tcp1
set sink2 [new Agent/TCPSink]
$ns attach-agent $n2 $sink2
$ns connect $tcp1 $sink2
$ns at 5 "$ftp0 start"
$ns at 5 "$ftp1 start"
$ns at 100 "$n1 setdest 550 550 15"
$ns at 190 "$n1 setdest 70 70 15"
proc finish { } {
global ns nf tf
$ns flush-trace
exec nam lab8.nam &
close $tf
exit 0
}
$ns at 250 "finish"
$ns run
```

AWK

```awk
# 20181CSE0621
BEGIN{
count1=0
count2=0
pack1=0
pack2=0
time1=0
time2=0
}
{
if($1= ="r"&& $3= ="1" && $4= ="AGT")
{
count1++
pack1=pack1+$8
time1=$2
}
if($1= ="r" && $3= ="2" && $4= ="AGT")
{
count2++
pack2=pack2+$8
time2=$2
}
}
END{
printf("The Throughput from n0 to n1: %f Mbps \n", ((count1*pack1*8)/(time1*1000000)));
printf("The Throughput from n1 to n2: %f Mbps", ((count2*pack2*8)/(time2*1000000)));
}
```

Simulation

```
ram@LAPTOP-MVFDFOVD: ~                                                    −    □    ×
(gedit:84): dconf-WARNING **: 17:12:01.575: failed to commit changes to dconf: Error spawning command line "dbus-launch
--autolaunch= --binary-syntax --close-stderr": Child process exited with code 1

(gedit:84): dconf-WARNING **: 17:12:01.583: failed to commit changes to dconf: Error spawning command line "dbus-launch
--autolaunch= --binary-syntax --close-stderr": Child process exited with code 1

(gedit:84): dconf-WARNING **: 17:12:01.585: failed to commit changes to dconf: Error spawning command line "dbus-launch
--autolaunch= --binary-syntax --close-stderr": Child process exited with code 1

** (gedit:84): WARNING **: 17:12:27.294: Set document metadata failed: Setting attribute metadata::gedit-position not su
pported

(gedit:84): dconf-WARNING **: 17:12:27.306: failed to commit changes to dconf: Error spawning command line "dbus-launch
--autolaunch= --binary-syntax --close-stderr": Child process exited with code 1
ram@LAPTOP-MVFDFOVD:~$ ns exp7.tcl
```

Simulation: