PART - A

Experiment 1:

Implement three nodes point – to – point network with duplex links between them.Set the queue size, vary the bandwidth and find the number of packets dropped.

Step1: Open text editor, type the below program and save with extention .tcl (**prog1.tcl**)

```
set ns [new Simulator]
set nf [open prog1.nam w]
$ns namtrace-all $nf
set nd [open prog1.tr w]
$ns trace-all $nd

proc finish { } {
global ns nf nd
$ns flush-trace
close $nf
close $nd
exec nam prog1.nam &
exit 0
}

set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]

$ns duplex-link $n0 $n1 1Mb 10ms DropTail
$ns duplex-link $n1 $n2 512kb 10ms DropTail
$ns queue-limit $n1 $n2 10

set udp0 [new Agent/UDP]
$ns attach-agent $n0 $udp0
set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.005
$cbr0 attach-agent $udp0
set sink [new Agent/Null]
$ns attach-agent $n2 $sink
$ns connect $udp0 $sink

$ns at 0.2 "$cbr0 start"
```

```
$ns at 4.5 "$cbr0 stop"
$ns at 5.0 "finish"
$ns run
```

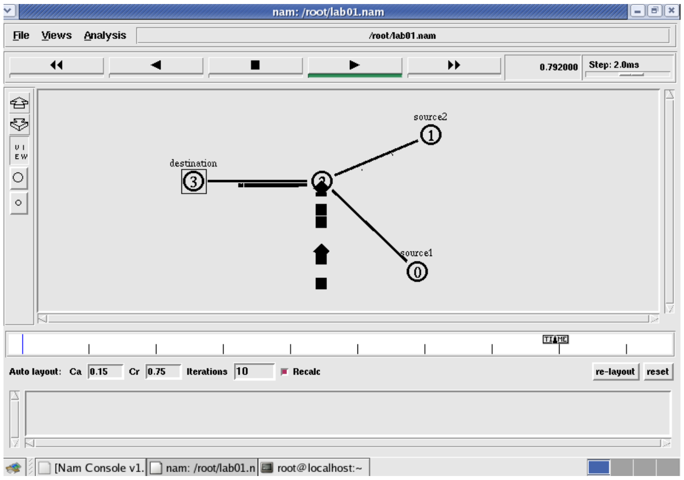
Step2: Open text editor, type the below program and save with extention .awk (**prog1.awk**)

```
BEGIN {
        dcount = 0;
        rcount = 0;
}
{
event = $1;
if(event == "d")
{
        dcount++;
}
if(event == "r")
{
        rcount++;
}
}
END {
printf("The no.of packets dropped  : %d\n ",dcount);
printf("The no.of packets recieved : %d\n ",rcount);
}
```

Step3: Run the simulation program

```
[root@localhost~]# ns prog1.tcl
```

(Here **"ns"** indicates network simulator. We get the topology shown in the snapshot.)



Auto layout: Ca 0.15 Cr 0.75 Iterations 10 Recalc

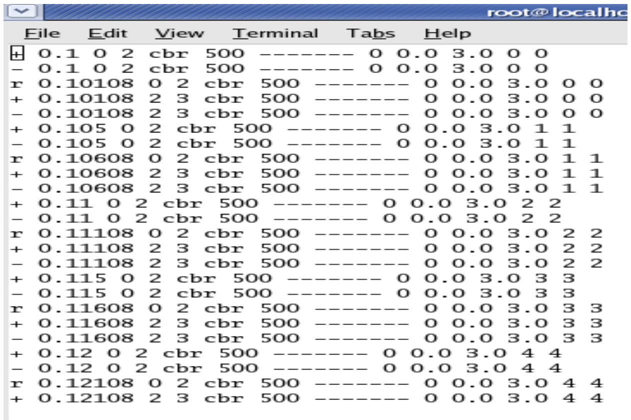
Step 4: Now press the play button in the simulation window and the simulation will begins.

Step 5: After simulation is completed run **awk file** to see the output ,

```
[root@localhost~]# awk  –f  prog1.awk  prog1.tr
Number of packets droped = 16
```

Step 6: To see the trace file contents open the file as ,

```
[root@localhost~]# vi prog1.tr
```



```
+ 0.1 0 2 cbr 500 -------- 0 0.0 3.0 0 0
- 0.1 0 2 cbr 500 -------- 0 0.0 3.0 0 0
r 0.10108 0 2 cbr 500 -------- 0 0.0 3.0 0 0
+ 0.10108 2 3 cbr 500 -------- 0 0.0 3.0 0 0
- 0.10108 2 3 cbr 500 -------- 0 0.0 3.0 0 0
+ 0.105 0 2 cbr 500 -------- 0 0.0 3.0 1 1
- 0.105 0 2 cbr 500 -------- 0 0.0 3.0 1 1
r 0.10608 0 2 cbr 500 -------- 0 0.0 3.0 1 1
+ 0.10608 2 3 cbr 500 -------- 0 0.0 3.0 1 1
- 0.10608 2 3 cbr 500 -------- 0 0.0 3.0 1 1
+ 0.11 0 2 cbr 500 -------- 0 0.0 3.0 2 2
- 0.11 0 2 cbr 500 -------- 0 0.0 3.0 2 2
r 0.11108 0 2 cbr 500 -------- 0 0.0 3.0 2 2
+ 0.11108 2 3 cbr 500 -------- 0 0.0 3.0 2 2
- 0.11108 2 3 cbr 500 -------- 0 0.0 3.0 2 2
+ 0.115 0 2 cbr 500 -------- 0 0.0 3.0 3 3
- 0.115 0 2 cbr 500 -------- 0 0.0 3.0 3 3
r 0.11608 0 2 cbr 500 -------- 0 0.0 3.0 3 3
+ 0.11608 2 3 cbr 500 -------- 0 0.0 3.0 3 3
- 0.11608 2 3 cbr 500 -------- 0 0.0 3.0 3 3
+ 0.12 0 2 cbr 500 -------- 0 0.0 3.0 4 4
- 0.12 0 2 cbr 500 -------- 0 0.0 3.0 4 4
r 0.12108 0 2 cbr 500 -------- 0 0.0 3.0 4 4
+ 0.12108 2 3 cbr 500 -------- 0 0.0 3.0 4 4
```

Experiment 2:

Implement transmission of ping messages/trace route over a network topologyconsisting of 6 nodes and find the number of packets dropped due to congestion.

Step1: Open text editor, type the below program and save with extention .tcl (**prog2.tcl**)

```
set ns [new Simulator]
set nf [open prog2.nam w]
$ns namtrace-all $nf
set nd [open prog2.tr w]
$ns trace-all $nd

proc finish {} {
global ns nf nd
$ns flush-trace
close $nf
close $nd
exec nam prog2.nam &
exit 0
}
```

```
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]
set n4 [$ns node]
set n5 [$ns node]
set n6 [$ns node]

$ns duplex-link $n1 $n0 1Mb 10ms DropTail
$ns duplex-link $n2 $n0 1Mb 10ms DropTail
$ns duplex-link $n3 $n0 1Mb 10ms DropTail
$ns duplex-link $n4 $n0 1Mb 10ms DropTail
$ns duplex-link $n5 $n0 1Mb 10ms DropTail
$ns duplex-link $n6 $n0 1Mb 10ms DropTail

Agent/Ping instproc recv {from rtt} {
$self instvar node_
puts "node [$node_ id] recieved ping answer from \
$from with round-trip-time $rtt ms."
}
set p1 [new Agent/Ping]
set p2 [new Agent/Ping]
set p3 [new Agent/Ping]
set p4 [new Agent/Ping]
set p5 [new Agent/Ping]
set p6 [new Agent/Ping]

$ns attach-agent $n1 $p1
$ns attach-agent $n2 $p2
$ns attach-agent $n3 $p3
$ns attach-agent $n4 $p4
$ns attach-agent $n5 $p5
$ns attach-agent $n6 $p6

$ns queue-limit $n0 $n4 3
$ns queue-limit $n0 $n5 2
$ns queue-limit $n0 $n6 2
$ns queue-limit $n0 $n3 2
$ns queue-limit $n0 $n2 1
$ns queue-limit $n0 $n1 2
```

```
$ns connect $p1 $p4
$ns connect $p2 $p5
$ns connect $p3 $p6
$ns connect $p6 $p3

$ns at 0.2 "$p1 send"
$ns at 0.4 "$p2 send"
$ns at 0.6 "$p3 send"
$ns at 1.0 "$p4 send"
$ns at 1.2 "$p5 send"
$ns at 1.4 "$p6 send"
$ns at 2.0 "finish"
$ns run
```

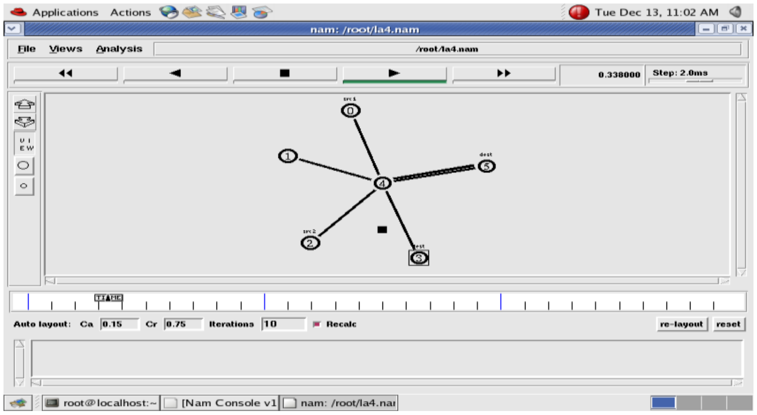
Step2: Open text editor, type the below program and save with extention .awk (**prog2.awk**)

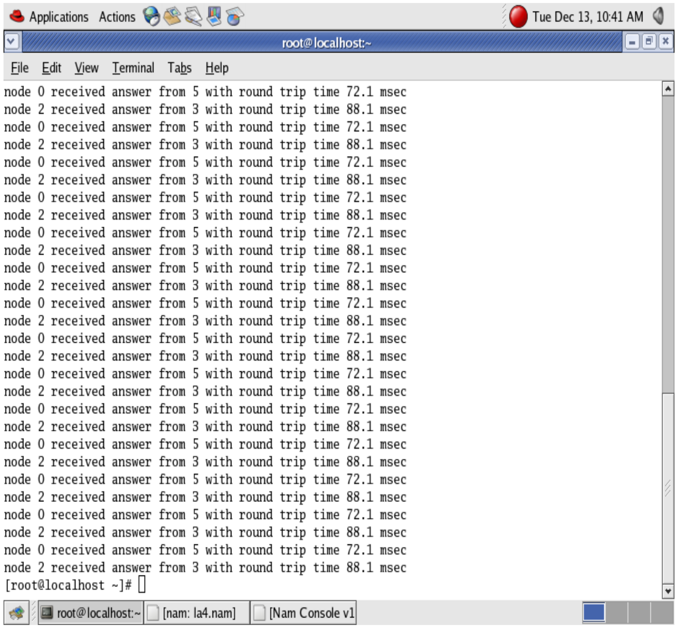
```
BEGIN {
count=0;
}
{
event=$1;
if(event=="d")
{
count++;
}
}
END {
printf("No of packets dropped : %d\n",count);
}
```

Step3: Run the simulation program

```
[root@localhost~]# ns prog2.tcl
```

(Here **“ns”** indicates network simulator. We get the topology shown in the snapshot.)





```
node 0 received answer from 5 with round trip time 72.1 msec
node 2 received answer from 3 with round trip time 88.1 msec
node 0 received answer from 5 with round trip time 72.1 msec
node 2 received answer from 3 with round trip time 88.1 msec
node 0 received answer from 5 with round trip time 72.1 msec
node 2 received answer from 3 with round trip time 88.1 msec
node 0 received answer from 5 with round trip time 72.1 msec
node 2 received answer from 3 with round trip time 88.1 msec
node 0 received answer from 5 with round trip time 72.1 msec
node 2 received answer from 3 with round trip time 88.1 msec
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node 2 received answer from 3 with round trip time 88.1 msec
node 0 received answer from 5 with round trip time 72.1 msec
node 2 received answer from 3 with round trip time 88.1 msec
[root@localhost ~]#
```
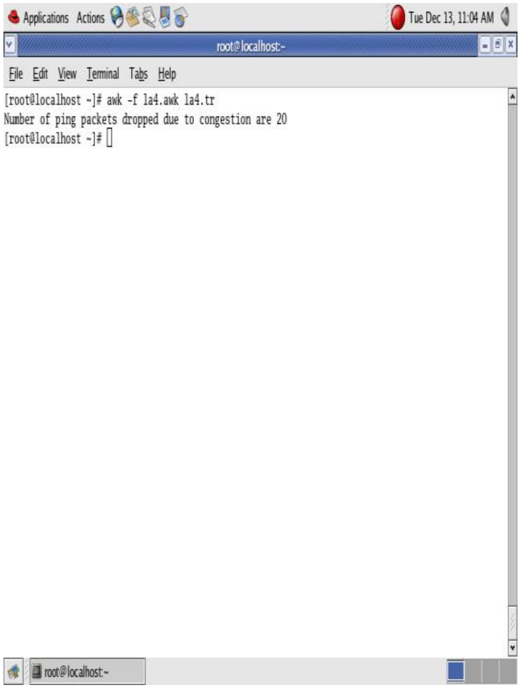

Step 4: Now press the play button in the simulation window and the simulation will begins.

Step 5: After simulation is completed run **awk file** to see the output ,

[root@localhost~]# awk –f prog2.awk prog2.tr



```
[root@localhost ~]# awk -f la4.awk la4.tr
Number of ping packets dropped due to congestion are 20
[root@localhost ~]#
```

Step 6: To see the trace file contents open the file as ,

[root@localhost~]# vi prog2.tr