Name: Aarna Bafna

Roll No.: 11

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Lab Assignment No 4

Aim: To install and configure network simulator and learn basics of TCLscripting.

Lab Outcome Attained: LO – 2 Demonstrate the installation and configuration of network simulator.

Theory and Program:

User Datagram Protocol (UDP) is a Transport Layer protocol. UDP is a part of the Internet Protocol suite, referred to as UDP/IP suite. Unlike TCP, it is an unreliable and connectionless protocol. So, there is no need to establish a connection prior to data transfer. The UDP helps to establish low-latency and loss-tolerating connections establish over the network.The UDP enables process to process communication.
Though Transmission Control Protocol (TCP) is the dominant transport layer protocol used with most of the Internet services; provides assured delivery, reliability, and much more but all these services cost us additional overhead and latency. Here, UDP comes into the picture. For real-time services like computer gaming, voice or video communication, live conferences; we need UDP. Since high performance is needed, UDP permits packets to be dropped instead of processing delayed packets. There is no error checking in UDP, so it also saves bandwidth. User Datagram Protocol (UDP) is more efficient in terms of both latency and bandwidth.

Program:

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

```
#Define different colors for data flows (for NAM)
$ns color 1 Orange
$ns color 2 Green

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

set np [open out.tr w]
$ns trace-all $np

#Define a 'finish' procedure
proc finish {} {        global ns nf
np
      $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]
set n4 [$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 2ms DropTail
$ns duplex-link $n1 $n4 2Mb 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
$ns duplex-link-op $n1 $n4 orient left

#Monitor the queue for link (n2-n3). (for NAM)
$ns duplex-link-op $n2 $n3 queuePos 0.5
#Setup a UDP connection set udp
[new Agent/UDP]
$ns attach-agent $n4 $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



# setting packet size
$cbr set packet_size_ 1000

#setting bit rate
$cbr set rate_ 1mb

# setting random false means no noise
$cbr set random_ false



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

#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
```

```
lab1003@lab1003-HP-280-G4-MT-Business-PC:~$ ns Vedant48udp.tcl
 When configured, ns found the right version of tclsh in /usr/bin/tclsh8.6
but it doesn't seem to be there anymore, so ns will fall back on running the first tclsh in your path. The wrong version of tclsh may break th
e test suites. Reconfigure and rebuild ns if this is a problem.
CBR packet size = 1000
CBR interval = 0.008000000000000002
lab1003@lab1003-HP-280-G4-MT-Business-PC:~$
```

WORKING:

set udp [new Agent/UDP] : This line creates a new UDP agent object named 'udp'.

$ns attach-agent $n4 $udp : This line attaches the UDP agent to node n4. set null [new Agent/Null] : This line creates a Null agent object named 'null'.

$ns attach-agent $n3 $null : This line attaches the Null agent to node n3.

$ns connect $udp $null : This line connects the UDP agent to the Null agent.

$udp set fid_ 2 : This line sets the flow ID of the UDP agent to 2.

set cbr [new Application/Traffic/CBR] : This line creates a CBR traffic application object named 'cbr'.

$cbr attach-agent $udp : This line attaches the CBR application to the UDP agent.

$cbr set packet_size_ 1000 : This line sets the packet size of the CBR application to 1000 bytes.

$cbr set rate_ 1mb : This line sets the bit rate of the CBR application to 1 Mbps.

$cbr set random_ false : This line sets the randomization of the CBR application to false, meaning there will be no variation in the packet sending rate.

$ns at 0.1 "$cbr start" : This line schedules the CBR application to start at 0.1 seconds in the simulation.

$ns at 4.5 "$cbr stop" : This line schedules the CBR application to stop at 4.5 seconds in the simulation.

$ns at 5.0 "finish" : This line schedules the 'finish' procedure to be called after 5.0 seconds of simulation time.

puts "CBR packet size = [$cbr set packet_size_]" : This line prints the packet size of the CBR application.

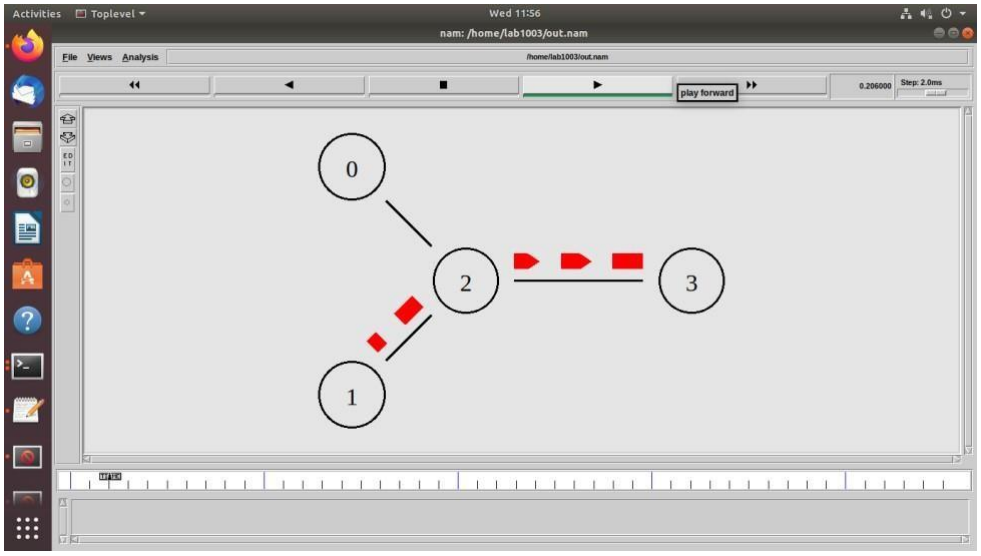
puts "CBR interval = [$cbr set interval_]" : This line prints the interval (rate) of the CBR application.

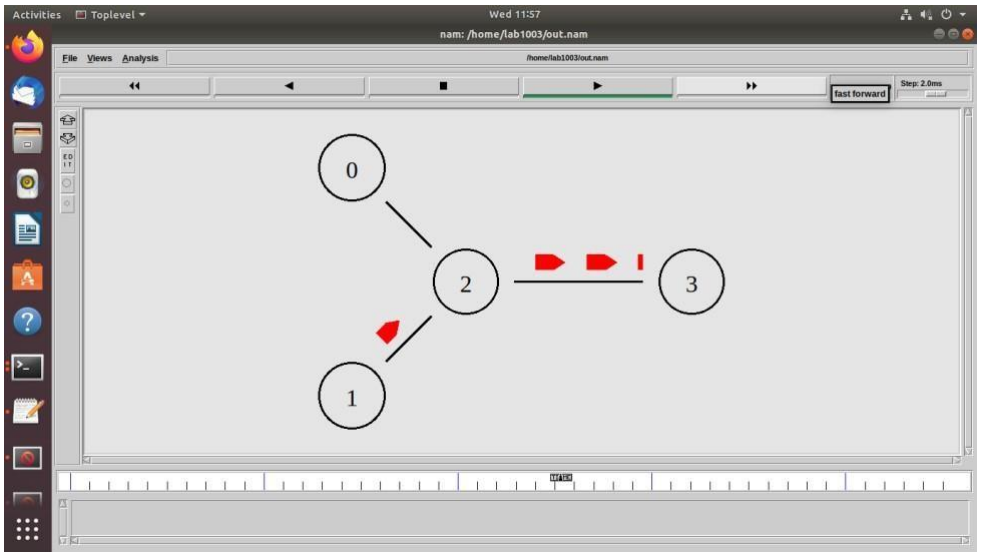
$ns run : This line starts the simulation.

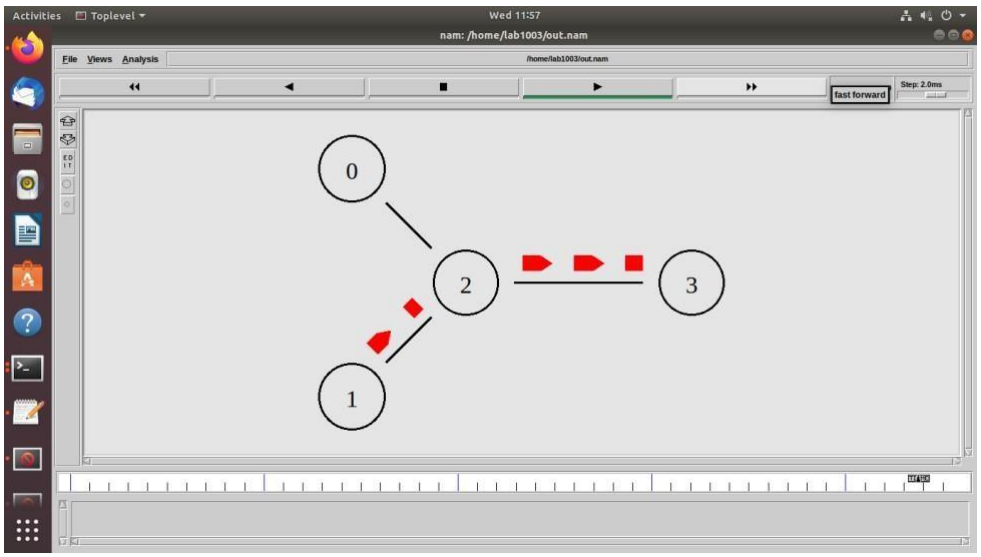
Variations:

1. **We can change the color of the data**
2. **We can change the orientation of the Queue**
3. **We can change the shape , numbers and links between the nodes**
4. **We can change the speed and duration of the data**
5. **We can change the starting and the ending of the nodes as well.**

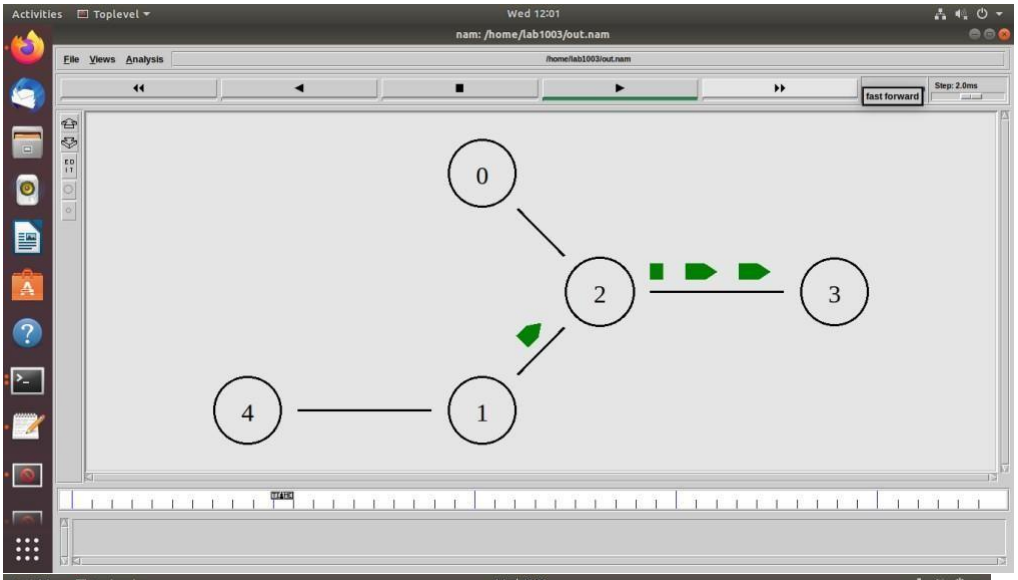
FOR 3 NODES:

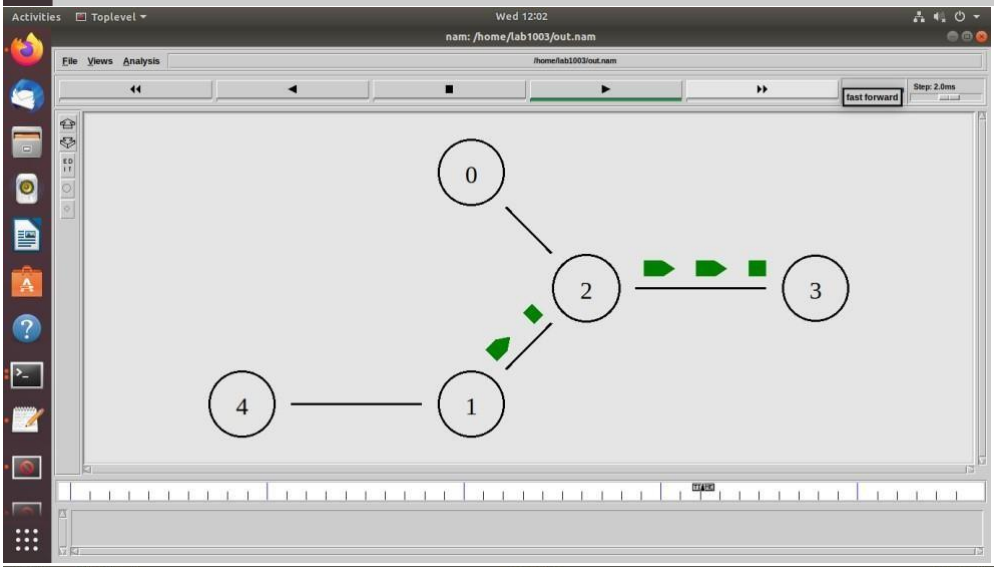

Activities
Toplevel
Wed 11:56
nam: /home/lab1003/out.nam
File
Views
Analysis
/home/lab1003/out.nam
play forward
0.206000
Step: 2.0ms
0
1
2
3

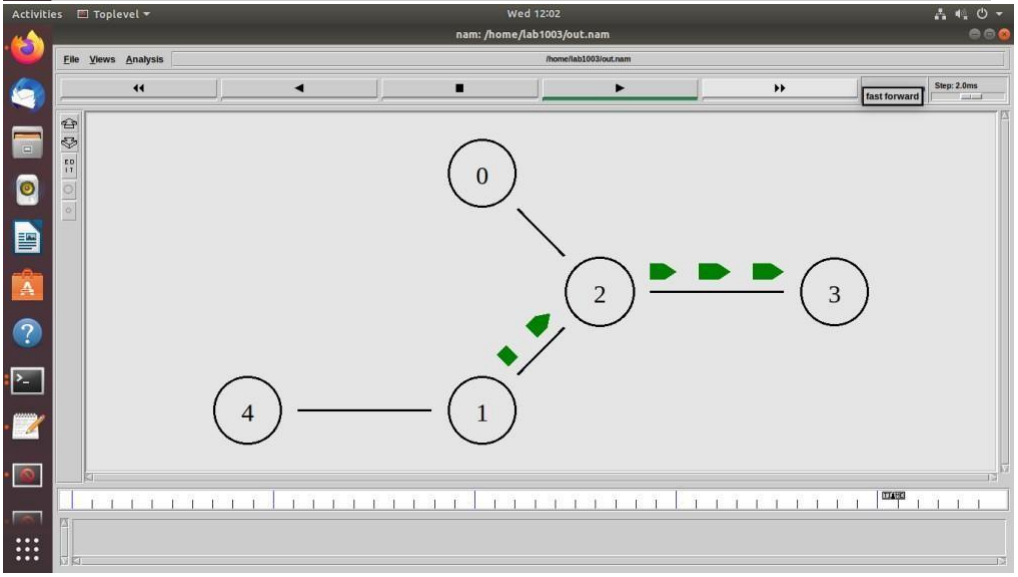

Activities
Toplevel
Wed 11:57
nam: /home/lab1003/out.nam
File
Views
Analysis
/home/lab1003/out.nam
fast forward
Step: 2.0ms
0
1
2
3

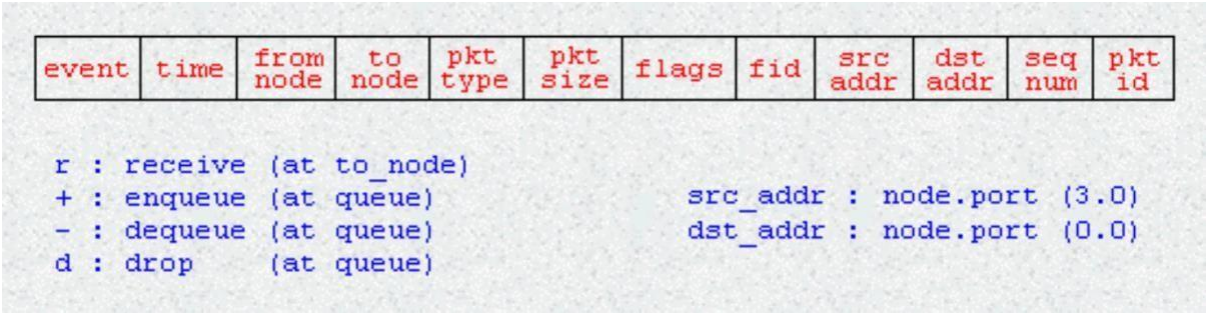

Activities
Toplevel
Wed 11:57
nam: /home/lab1003/out.nam
File
Views
Analysis
/home/lab1003/out.nam
fast forward
Step: 2.0ms
0
1
2
3

FOR 4 NODES


Activities
Toplevel
Wed 12:01
nam: /home/lab1003/out.nam
File Views Analysis
/home/lab1003/out.nam
fast forward
Step: 2.0ms
0
2
3
4
1


Activities
Toplevel
Wed 12:02
nam: /home/lab1003/out.nam
File Views Analysis
/home/lab1003/out.nam
fast forward
Step: 2.0ms
0
2
3
4
1


Activities
Toplevel
Wed 12:02
nam: /home/lab1003/out.nam
File Views Analysis
/home/lab1003/out.nam
fast forward
Step: 2.0ms
0
2
3
4
1



Trace :

<Event> <Time> <from> <to> <pktype> <size> --- <fid> <src> <dest> <seq> <pktid>

+ 0.1 1 2 CBR 1000 ------- 2 1.0 3.0 0 0
- 0.1 1 2 CBR 1000 ------- 2 1.0 3.0 0 0
+ 0.108 1 2 CBR 1000 ------- 2 1.0 3.0 1 1 - 0.108
1 2 CBR 1000 ------- 2 1.0 3.0 1 1
R 0.114 1 2 CBR 1000 ------- 2 1.0 3.0 0 0
+ 0.114 2 3 CBR 1000 ------- 2 1.0 3.0 0 0
- 0.114 2 3 CBR 1000 ------- 2 1.0 3.0 0 0
+ 0.116 1 2 CBR 1000 ------- 2 1.0 3.0 2 2 - 0.116
1 2 CBR 1000 ------- 2 1.0 3.0 2 2
R 0.122 1 2 CBR 1000 ------- 2 1.0 3.0 1 1
+ 0.122 2 3 CBR 1000 ------- 2 1.0 3.0 1 1
- 0.122 2 3 CBR 1000 --------2 1.0 3.0 1 1
+ 0.124 1 2 CBR 1000 ------- 2 1.0 3.0 3 3
- 0.124 1 2 CBR 1000 --------2 1.0 3.0 3 3
R 0.13 1 2 CBR 1000 --------2 1.0 3.0 2 2
+ 0.13 2 3 CBR 1000 --------2 1.0 3.0 2 2
- 0.13 2 3 CBR 1000 ------- 2 1.0 3.0 2 2
+ 0.132 1 2 CBR 1000 ------- 2 1.0 3.0 4 4 - 0.132
1 2 CBR 1000 ------- 2 1.0 3.0 4 4
R 0.138 1 2 CBR 1000 ------- 2 1.0 3.0 3 3
+ 0.138 2 3 CBR 1000 ------- 2 1.0 3.0 3 3
- 0.138 2 3 CBR 1000 --------2 1.0 3.0 3 3
R 0.138706 2 3 CBR 1000 ------- 2 1.0 3.0 0 0
+ 0.14 1 2 CBR 1000 --------2 1.0 3.0 5 5
- 0.14 1 2 CBR 1000 ------- 2 1.0 3.0 5 5
R 0.146 1 2 CBR 1000 ------- 2 1.0 3.0 4 4
+ 0.146 2 3 CBR 1000 ------- 2 1.0 3.0 4 4
- 0.146 2 3 CBR 1000 --------2 1.0 3.0 4 4

Lab outcomes: Demonstrate and measure different network scenarios and their performance behavior . Analyze the traffic flow of different protocols