IMPLEMENTING OF WIRELESS NETOWRK SCENARIO USING NS2

CSE1004(NETWORK AND COMMUNICATION)THEORY:A1+TA1

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NETWORK SCENARIO EXPLANATION:

Wireless Network Simulation in NS2:

6 Nodes

Protocol Used: AODV Protocol (Adhoc On-Demand Distance Vector)

Two ray ground propagation

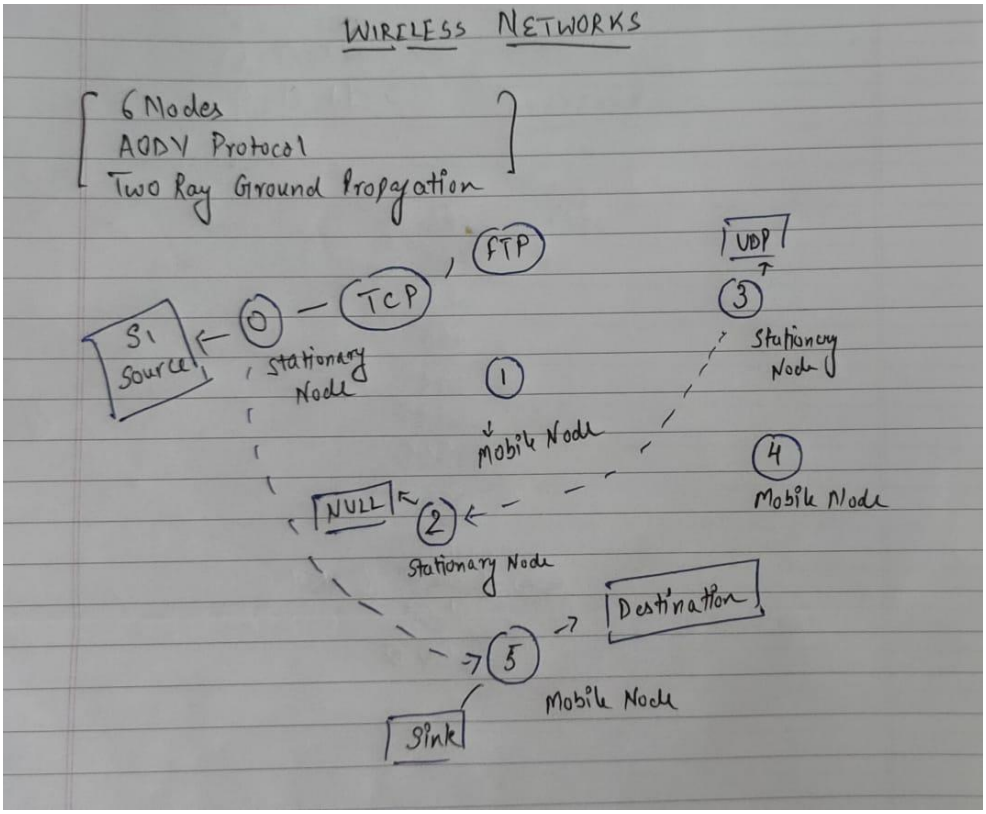
- The source node is node 1 and destination is sink node 5
- The source node will be a stationary node
- While destination node i.e. sink node 5 will be a moving node

Source node 1:

- Will have a tcp agent
- Will carry ftp packets

Other nodes:

- Node 2 will have a udp agent and will be stationary
- Node 3 will be a null agent and it will be a stationary node



We will be using a tcl file for demonstration

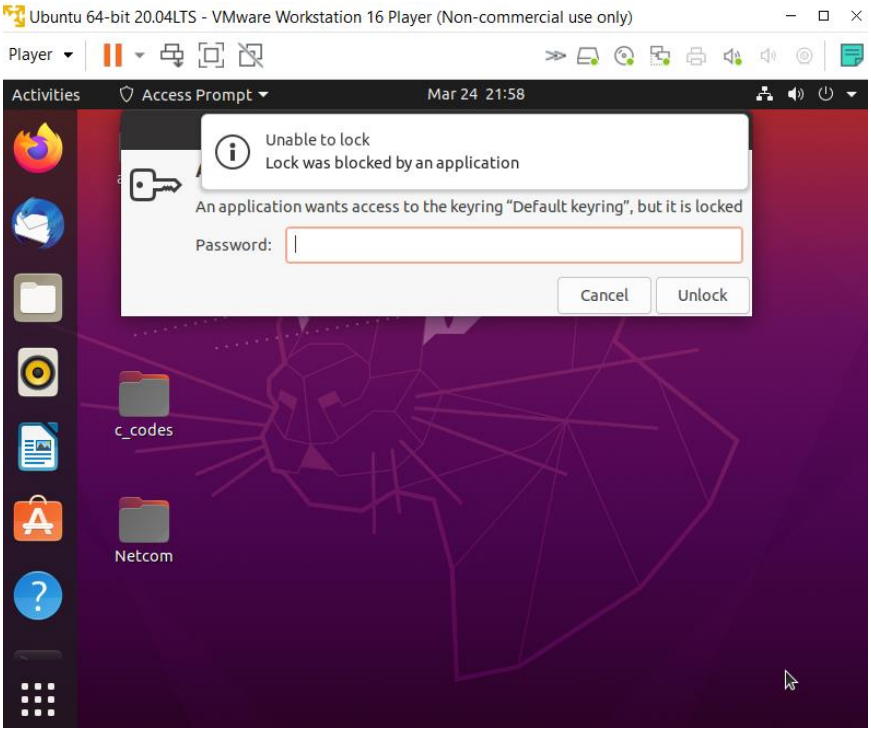
SIMULATION AND NS2:

Network simulation (NS) is one of the types of simulation, which is used to simulate the networks such as in MANETs, VANETs, etc. It provides simulation for routing and multicast protocols for both wired and wireless networks. NS is licensed for use under version 2 of the GNU (General Public License) and is popularly known as **NS2**. It is an object-oriented, discrete event-driven simulator written in C++ and Otcl/Tcl.

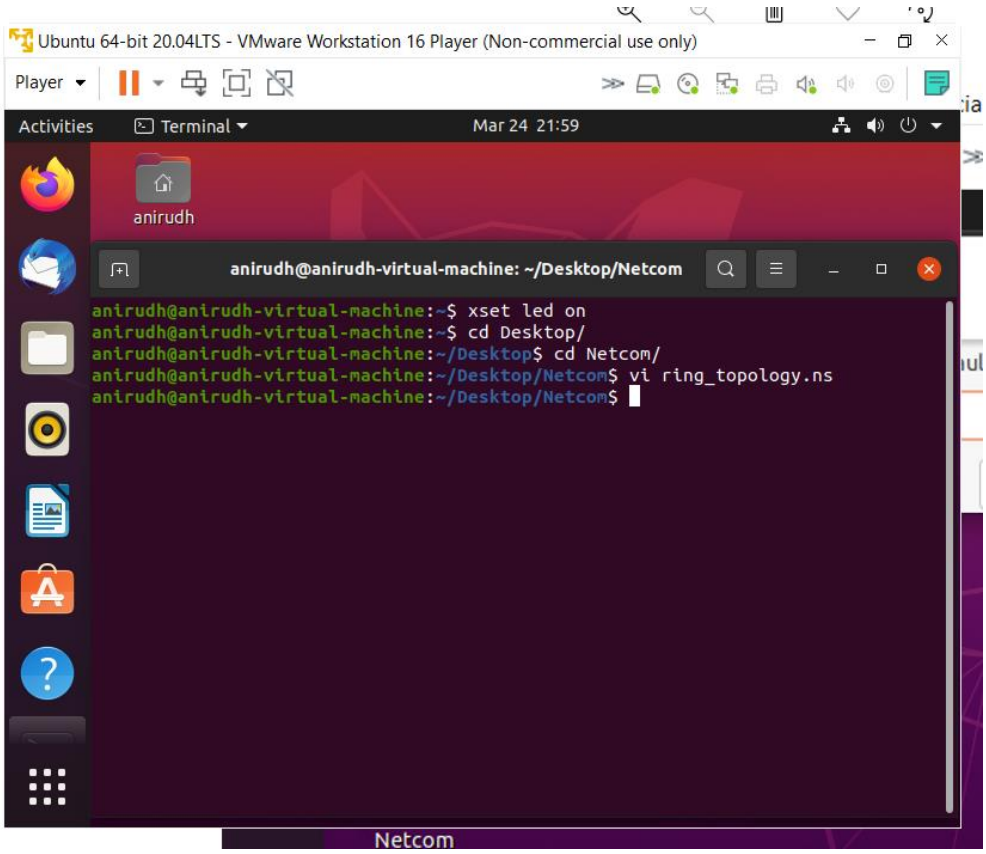
NS-2 can be used to implement network protocols such as TCP and UPD, traffic source behaviour such as FTP, Telnet, Web, CBR, and VBR, router queues management mechanism such as Drop Tail, RED, and CBQ, routing algorithms, and many more. In ns2, C++ is used for detailed protocol implementation and Otcl is used for the setup. The compiled C++ objects are made available to the Otcl interpreter and in this way, the ready-made C++ objects can be controlled from the OTcl level.

PROCEDURE:

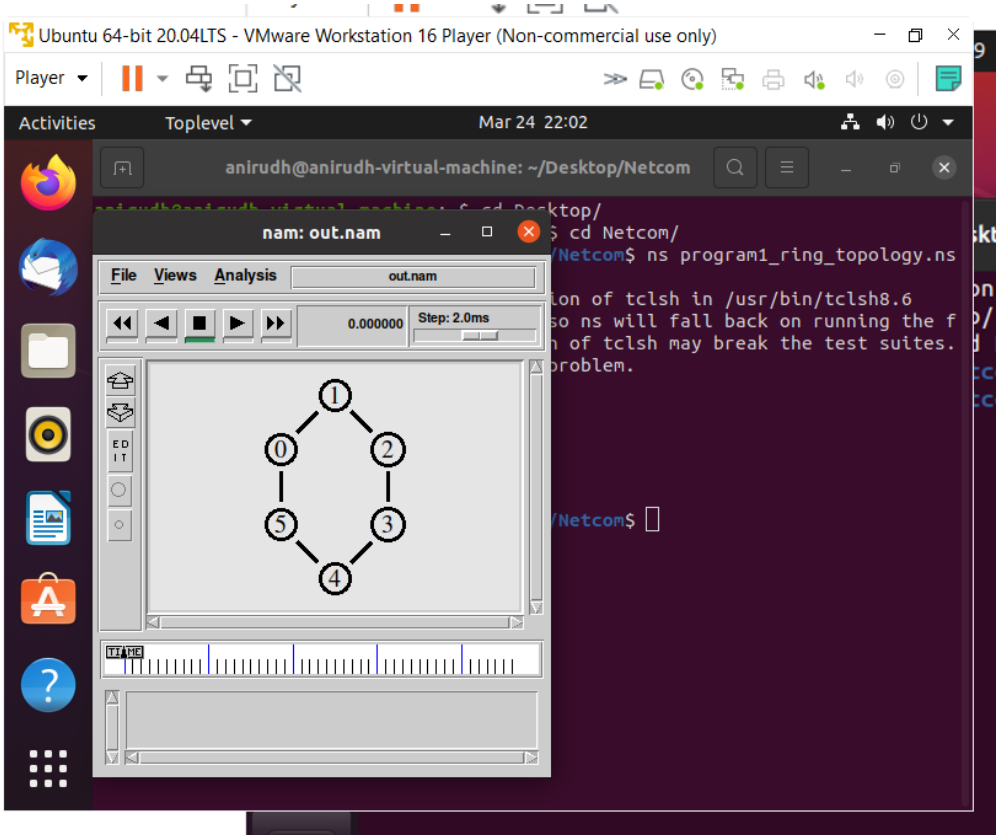
- **Open your vmware having an Ubuntu linux distribution:**



- **U must have all the necessary c and ns2 compilers already installed in your linux system.**
- **Using terminal open a vi editor and write your ns2 code with the command ns filename.ns**



- **After saving the file run ns filename.ns command to execute it using nam**



FOR WIRELESS NETOWRKS(PROCEDURE/ALGORITHM):

#Step 1 initialize variables
#Step 2 - Create a Simulator object
#Step 3 - Create Tracing and animation file
#Step 4 - topography
#Step 5 - GOD - General Operations Director
#Step 6 - Create nodes
#Step 7 - Create Channel (Communication PATH)
#Step 8 - Position of the nodes (Wireless nodes needs a location)
#Step 9 - Any mobility codes (if the nodes are moving)
#Step 10 - TCP, UDP Traffic
#Run the simulation

CODE:

```
#Example of Wireless networks
#Step 1 initialize variables
#Step 2 - Create a Simulator object
#step 3 - Create Tracing and animation file
#step 4 - topography
#step 5 - GOD - General Operations Director
#step 6 - Create nodes
#Step 7 - Create Channel (Communication PATH)
#step 8 - Position of the nodes (Wireless nodes needs a location)
#step 9 - Any mobility codes (if the nodes are moving)
#step 10 - TCP, UDP Traffic
#run the simulation

#initialize the variables
set val(chan)           Channel/WirelessChannel    ;#Channel Type
set val(prop)           Propagation/TwoRayGround   ;# radio-propagation model
set val(netif)          Phy/WirelessPhy            ;# network interface type
WAVELAN DSSS 2.4GHz
set val(mac)            Mac/802_11                 ;# MAC type
set val(ifq)            Queue/DropTail/PriQueue    ;# interface queue type
set val(ll)             LL                         ;# link layer type
set val(ant)            Antenna/OmniAntenna        ;# antenna model
set val(ifqlen)         50                         ;# max packet in ifq
set val(nn)             6                          ;# number of mobilenodes
set val(rp)             AODV                       ;# routing protocol
set val(x)  500   ;# in metres
set val(y)  500   ;# in metres
#Adhoc OnDemand Distance Vector
```

```
#creation of Simulator
set ns [new Simulator]

#creation of Trace and namfile
set tracefile [open wireless.tr w]
$ns trace-all $tracefile

#Creation of Network Animation file
set namfile [open wireless.nam w]
$ns namtrace-all-wireless $namfile $val(x) $val(y)

#create topography
set topo [new Topography]
$topo load_flatgrid $val(x) $val(y)

#GOD Creation - General Operations Director
create-god $val(nn)

set channel1 [new $val(chan)]
set channel2 [new $val(chan)]
set channel3 [new $val(chan)]

#configure the node
$ns node-config -adhocRouting $val(rp) \
  -llType $val(ll) \
  -macType $val(mac) \
  -ifqType $val(ifq) \
  -ifqLen $val(ifqlen) \
  -antType $val(ant) \
  -propType $val(prop) \
  -phyType $val(netif) \
  -topoInstance $topo \
  -agentTrace ON \
  -macTrace ON \
  -routerTrace ON \
  -movementTrace ON \
  -channel $channel1

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

$n0 random-motion 0
$n1 random-motion 0
```

```
$n2 random-motion 0
$n3 random-motion 0
$n4 random-motion 0
$n5 random-motion 0

$ns initial_node_pos $n0 20
$ns initial_node_pos $n1 20
$ns initial_node_pos $n2 20
$ns initial_node_pos $n3 20
$ns initial_node_pos $n4 20
$ns initial_node_pos $n5 50

#initial coordinates of the nodes
$n0 set X_ 10.0
$n0 set Y_ 20.0
$n0 set Z_ 0.0

$n1 set X_ 210.0
$n1 set Y_ 230.0
$n1 set Z_ 0.0

$n2 set X_ 100.0
$n2 set Y_ 200.0
$n2 set Z_ 0.0

$n3 set X_ 150.0
$n3 set Y_ 230.0
$n3 set Z_ 0.0

$n4 set X_ 430.0
$n4 set Y_ 320.0
$n4 set Z_ 0.0

$n5 set X_ 270.0
$n5 set Y_ 120.0
$n5 set Z_ 0.0
#Dont mention any values above than 500 because in this example, we use X and
Y as 500,500

#mobility of the nodes
#At what Time? Which node? Where to? at What Speed?
$ns at 1.0 "$n1 setdest 490.0 340.0 25.0"
$ns at 1.0 "$n4 setdest 300.0 130.0 5.0"
$ns at 1.0 "$n5 setdest 190.0 440.0 15.0"
#the nodes can move any number of times at any location during the simulation
(runtime)
$ns at 20.0 "$n5 setdest 100.0 200.0 30.0"
```

```
#creation of agents
set tcp [new Agent/TCP]
set sink [new Agent/TCPSink]
$ns attach-agent $n0 $tcp
$ns attach-agent $n5 $sink
$ns connect $tcp $sink
set ftp [new Application/FTP]
$ftp attach-agent $tcp
$ns at 1.0 "$ftp start"

set udp [new Agent/UDP]
set null [new Agent/Null]
$ns attach-agent $n2 $udp
$ns attach-agent $n3 $null
$ns connect $udp $null
set cbr [new Application/Traffic/CBR]
$cbr attach-agent $udp

$tcp set class_ 0
$ns color 0 green


$ns at 1.0 "$cbr start"
$ns at 30.0 "finish"

proc finish {} {
 global ns tracefile namfile
 $ns flush-trace
 close $tracefile
 close $namfile
 exit 0
}

puts "Starting Simulation"
$ns run
```

CODE SNAPSHOTS:

Ubuntu 64-bit 20.04LTS - VMware Workstation 16 Player (Non-commercial use only)

Player

Activities Text Editor Apr 23 01:54

Open wireless.tcl ~/Desktop/Netcom

```
#Example of Wireless networks
#Step 1 initialize variables
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set val(mac)            Mac/802_11                 ;# MAC type
set val(ifq)            Queue/DropTail/PriQueue    ;# interface queue type
set val(ll)             LL                         ;# link layer type
set val(ant)            Antenna/OmniAntenna        ;# antenna model
set val(ifqlen)         50                         ;# max packet in ifq
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#Adhoc OnDemand Distance Vector

#creation of Simulator
set ns [new Simulator]

#creation of Trace and namfile
set tracefile [open wireless.tr w]
$ns trace-all $tracefile

#Creation of Network Animation file
set namfile [open wireless.nam w]
$ns namtrace-all-wireless $namfile $val(x) $val(y)

#create topography
set topo [new Topography]
$topo load_flatgrid $val(x) $val(y)

#GOD Creation - General Operations Director
create-god $val(nn)
```

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Open wireless.tcl ~/Desktop/Netcom

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$topo load_flatgrid $val(x) $val(y)

#GOD Creation - General Operations Director
create-god $val(nn)

set channel1 [new $val(chan)]
set channel2 [new $val(chan)]
set channel3 [new $val(chan)]

#configure the node
$ns node-config -adhocRouting $val(rp) \
  -llType $val(ll) \
  -macType $val(mac) \
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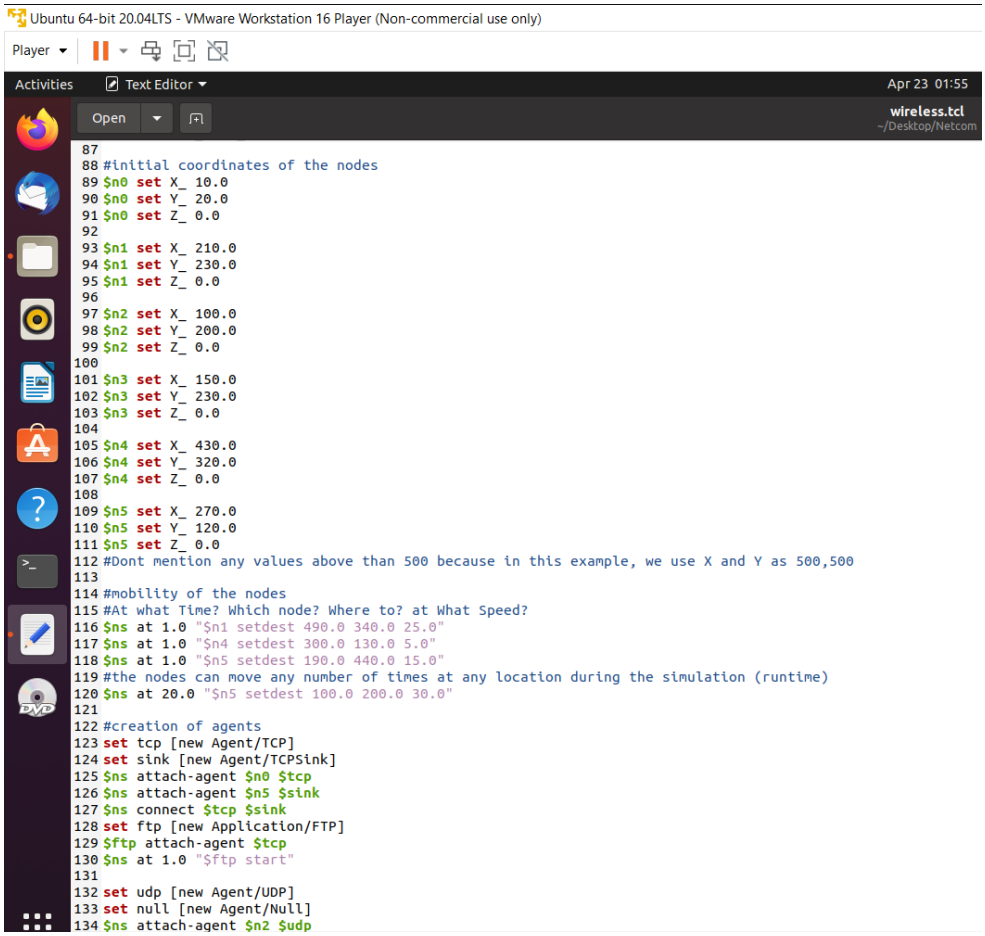
  -ifqLen $val(ifqlen) \
  -antType $val(ant) \
  -propType $val(prop) \
  -phyType $val(netif) \
  -topoInstance $topo \
  -agentTrace ON \
  -macTrace ON \
  -routerTrace ON \
  -movementTrace ON \
  -channel $channel1

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

$n0 random-motion 0
$n1 random-motion 0
$n2 random-motion 0
$n3 random-motion 0
$n4 random-motion 0
$n5 random-motion 0

$ns initial_node_pos $n0 20
$ns initial_node_pos $n1 20
$ns initial_node_pos $n2 20
$ns initial_node_pos $n3 20
$ns initial_node_pos $n4 20
$ns initial_node_pos $n5 50

#initial coordinates of the nodes
$n0 set X  10.0
```




```
87
88 #initial coordinates of the nodes
89 $n0 set X_ 10.0
90 $n0 set Y_ 20.0
91 $n0 set Z_ 0.0
92
93 $n1 set X_ 210.0
94 $n1 set Y_ 230.0
95 $n1 set Z_ 0.0
96
97 $n2 set X_ 100.0
98 $n2 set Y_ 200.0
99 $n2 set Z_ 0.0
100
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103 $n3 set Z_ 0.0
104
105 $n4 set X_ 430.0
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107 $n4 set Z_ 0.0
108
109 $n5 set X_ 270.0
110 $n5 set Y_ 120.0
111 $n5 set Z_ 0.0
112 #Dont mention any values above than 500 because in this example, we use X and Y as 500,500
113
114 #mobility of the nodes
115 #At what Time? Which node? Where to? at What Speed?
116 $ns at 1.0 "$n1 setdest 490.0 340.0 25.0"
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120 $ns at 20.0 "$n5 setdest 100.0 200.0 30.0"
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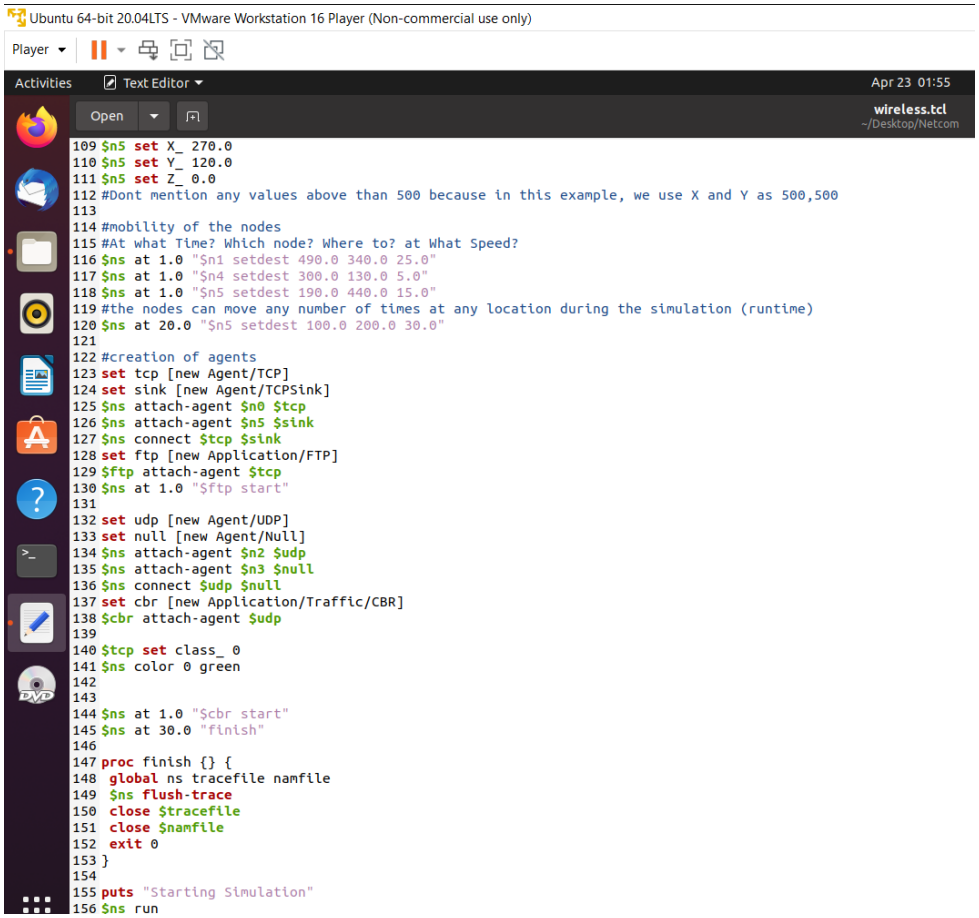
124 set sink [new Agent/TCPSink]
125 $ns attach-agent $n0 $tcp
126 $ns attach-agent $n5 $sink
127 $ns connect $tcp $sink
128 set ftp [new Application/FTP]
129 $ftp attach-agent $tcp
130 $ns at 1.0 "$ftp start"
131
132 set udp [new Agent/UDP]
133 set null [new Agent/Null]
134 $ns attach-agent $n2 $udp
```




```
109 $n5 set X_ 270.0
110 $n5 set Y_ 120.0
111 $n5 set Z_ 0.0
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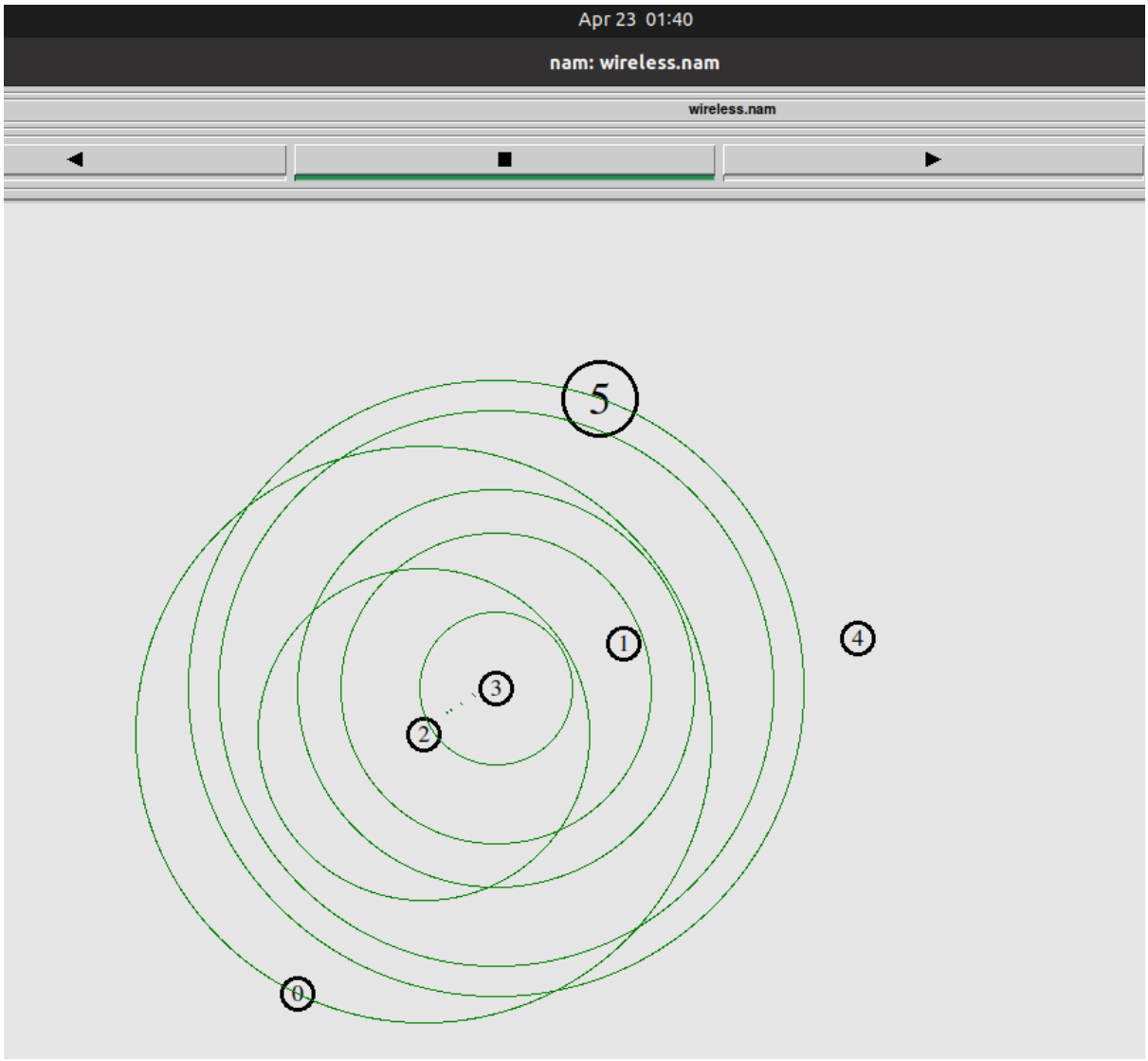
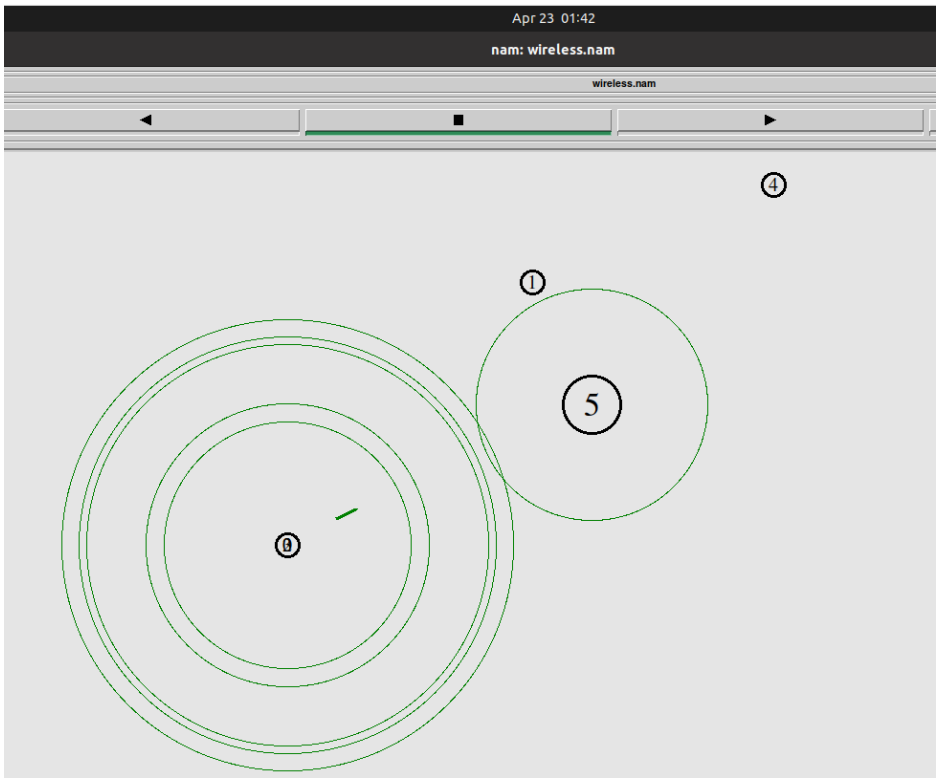
127 $ns connect $tcp $sink
128 set ftp [new Application/FTP]
129 $ftp attach-agent $tcp
130 $ns at 1.0 "$ftp start"
131
132 set udp [new Agent/UDP]
133 set null [new Agent/Null]
134 $ns attach-agent $n2 $udp
135 $ns attach-agent $n3 $null
136 $ns connect $udp $null
137 set cbr [new Application/Traffic/CBR]
138 $cbr attach-agent $udp
139
140 $tcp set class_ 0
141 $ns color 0 green
142
143
144 $ns at 1.0 "$cbr start"
145 $ns at 30.0 "finish"
146
147 proc finish {} {
148  global ns tracefile namfile
149  $ns flush-trace
150  close $tracefile
151  close $namfile
152  exit 0
153 }
154
155 puts "Starting Simulation"
156 $ns run
```

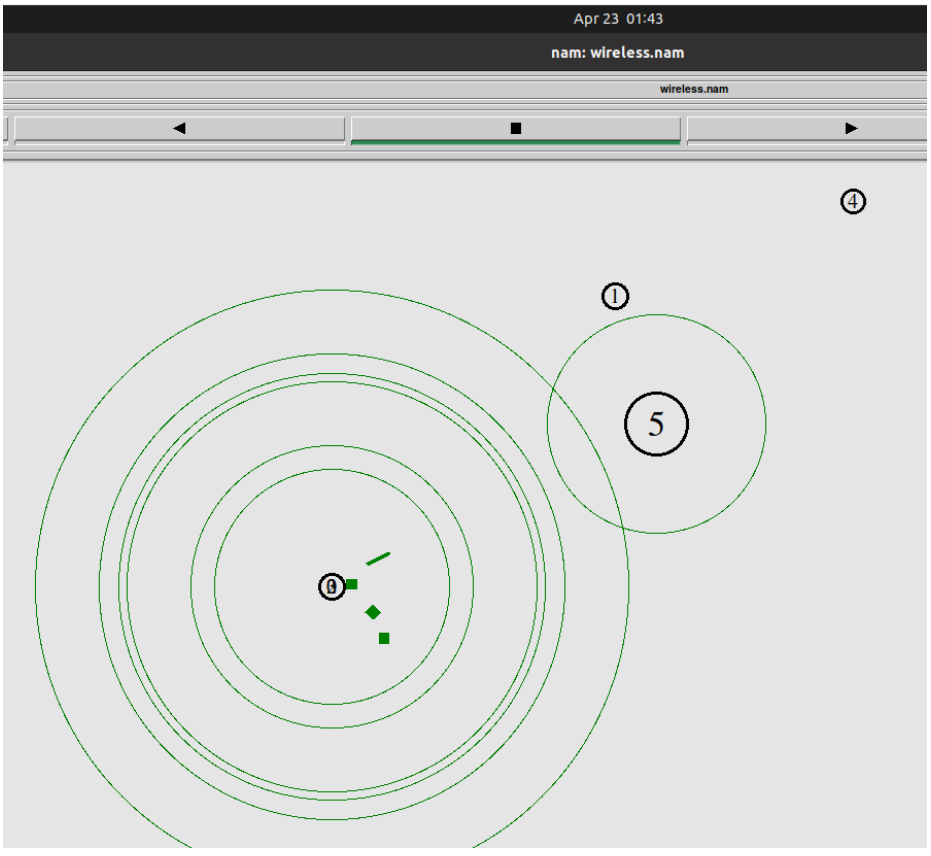
OUTPUT:NAM OUTPUT(ANIMATION):

FOR SHOWING TRANSFER OF UDP PACKETS BETWEEN NODE 2 AND 3

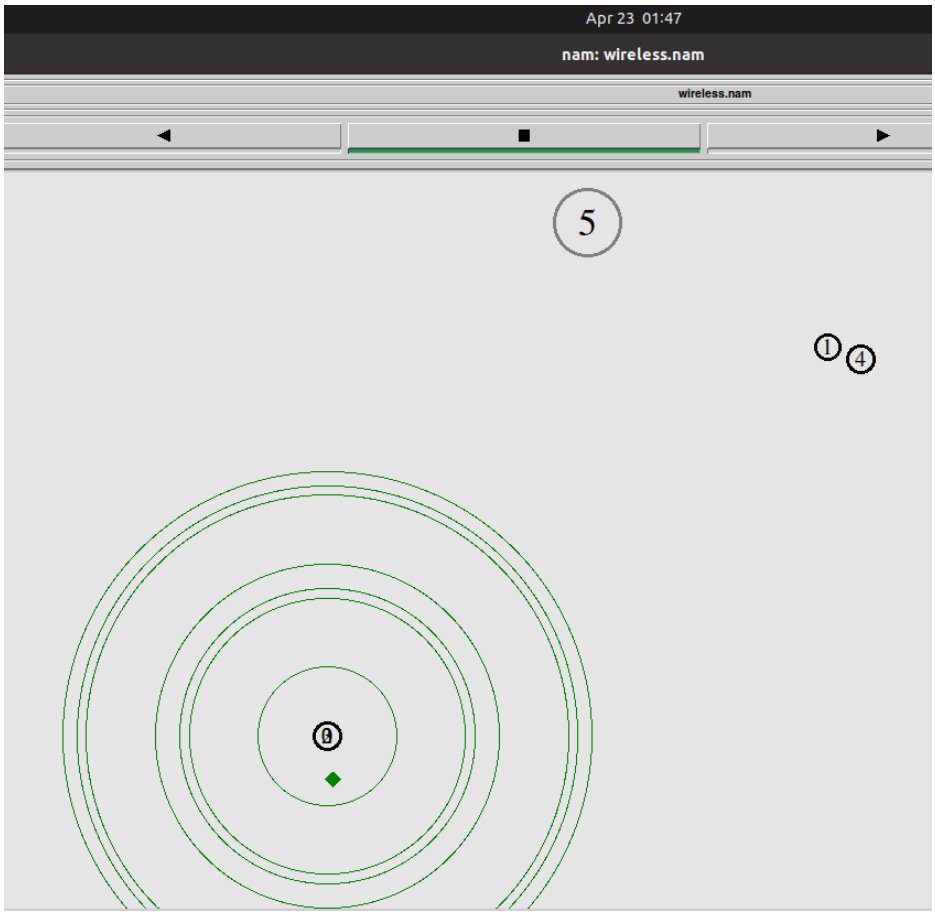


The node 5 is receiving packets from node 1 via a wireless connection

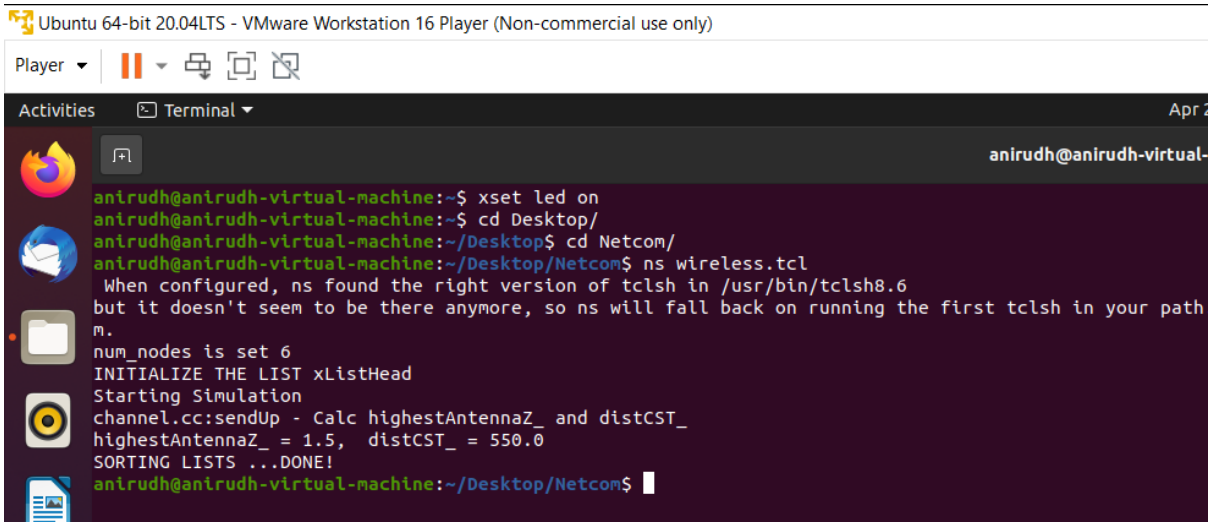




Some packets are dropped in between when node 5 moves far away from node 1



OUTPUT IN CONSOLE:

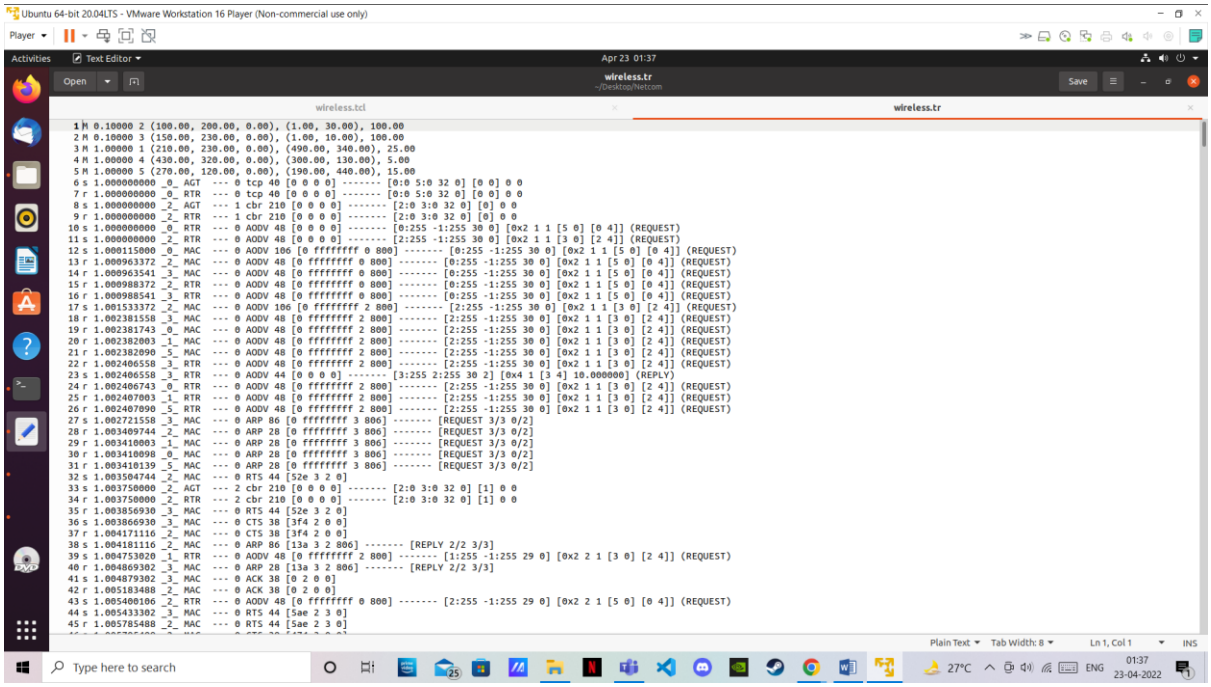


- 1 list header is there for channel 1
- Number of nodes is 6.
- Highest antenna position from ground level: 1.5

TRACE FILE:

AS THE TRACE FILE IS VERY LONG WE ARE ONLY ATTACHING A PART OF IT:

STARTING OF TRACE FILE:



ENDING OF TRACE FILE: