6. Set up a 2-node wireless network. Analyze performance for this scenario with DSDV as routing protocol

Save this file as p6.tcl :-

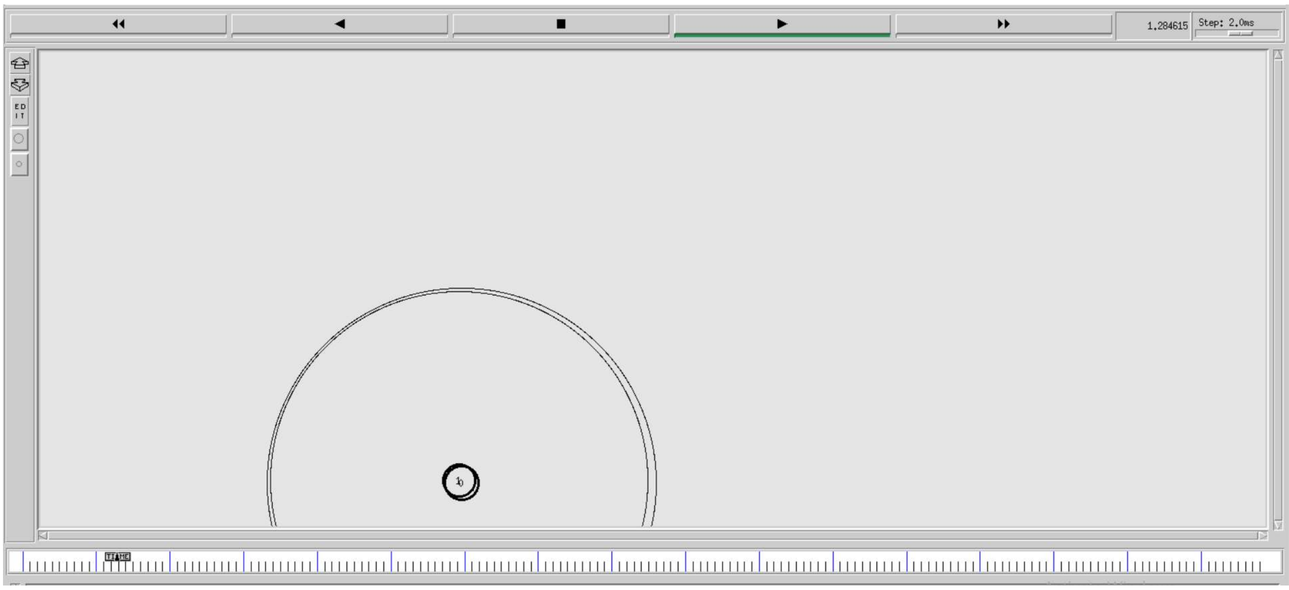
```
set val(chan) Channel/WirelessChannel
set val(prop) Propagation/TwoRayGround
set val(netif) Phy/WirelessPhy
set val(mac) Mac/802_11
set val(ifq) Queue/DropTail/PriQueue
set val(ll) LL
set val(ant) Antenna/OmniAntenna
set val(x) 500
set val(y) 500
set val(ifqlen) 50
set val(nn) 2
set val(stop) 20.0
set val(rp) DSDV

set ns_  [new Simulator]
set tracefd [open 001.tr w]
$ns_ trace-all $tracefd
set namtrace [open 001.nam w]
$ns_ namtrace-all-wireless $namtrace $val(x) $val(y)
set prop [new $val(prop)]
set topo [new Topography]
$topo load_flatgrid $val(x) $val(y)

create-god $val(nn)


$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) \
        -channelType $val(chan) \
        -topoInstance $topo \
        -agentTrace ON  \
        -routerTrace ON \
        -macTrace ON

for {set i 0} {$i < $val(nn) } {incr i} {
        set node_($i) [$ns_ node]
        $node_($i) random-motion 0
        }
```

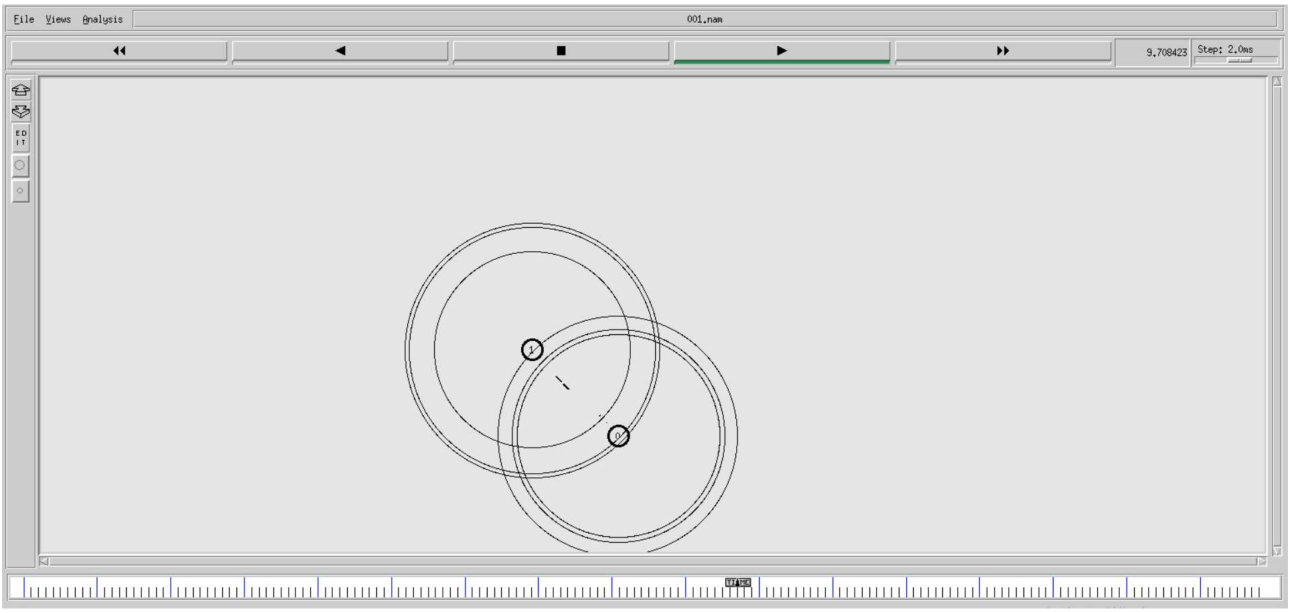
```
for {set i 0} {$i < $val(nn)} {incr i} {
 $ns_ initial_node_pos $node_($i) 40
 }

$ns_ at 1.1 "$node_(0) setdest 310.0 10.0 20.0"
$ns_ at 1.1 "$node_(1) setdest 10.0 310.0 20.0"


set tcp0 [new Agent/TCP]
set sink0 [new Agent/TCPSink]
$ns_ attach-agent $node_(0) $tcp0
$ns_ attach-agent $node_(1) $sink0
$ns_ connect $tcp0 $sink0
set ftp0 [new Application/FTP]
$ftp0 attach-agent $tcp0

$ns_ at 1.0 "$ftp0 start"
$ns_ at 18.0 "$ftp0 stop"

for {set i 0} {$i < $val(nn)} {incr i} {
$ns_ at $val(stop) "$node_($i) reset";
 }

$ns_ at $val(stop) "puts \"NS EXITING...\"; $ns_ halt"
puts "Starting Simulation..."

$ns_ run
```

Execution commands:-

1)ns p6.tcl
2)nam 001.nam

Outputs:-




File
Views
Analysis
001.nam
9.708423
Step: 2.0ms
EDIT
1
0

7.Set up 3-node wireless network with node N1 between NO and N2. As the nodes NO and N2 moves towards each other they exchange packets. As they move out of each other's range they drop some packets. Analyze TCP performance for this scenario with AODV, DSDV and DSR as routing protocols.

Save this as p7.tcl :-

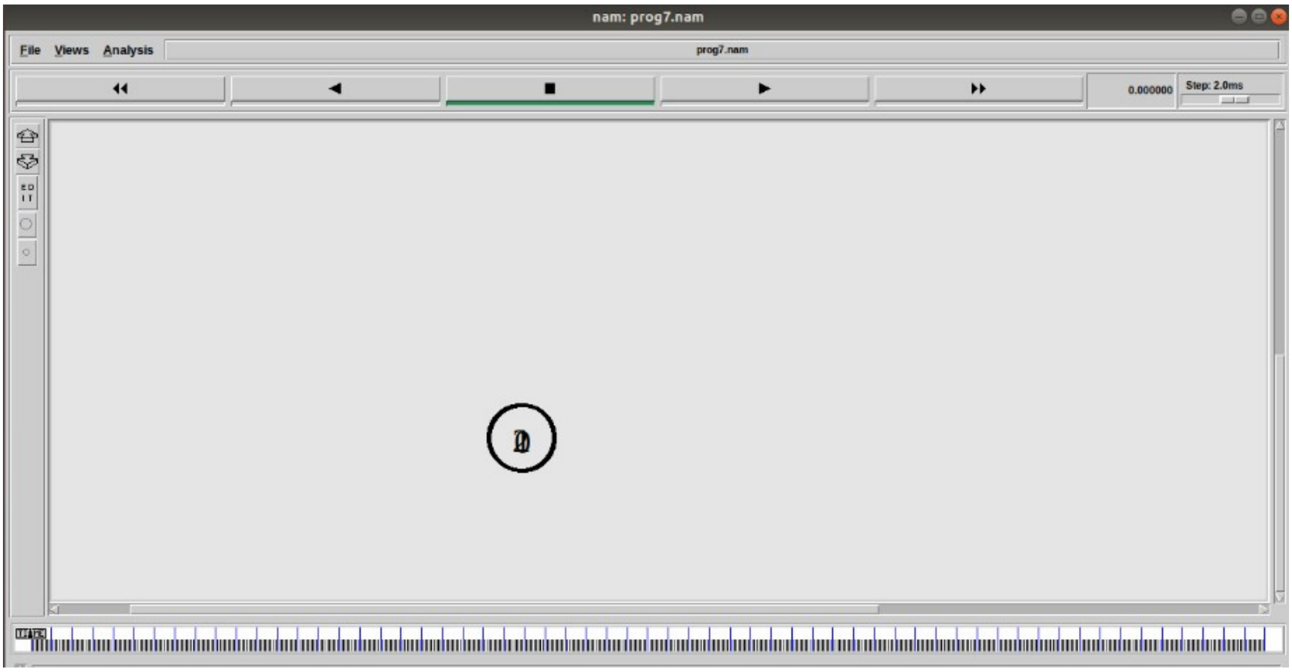
```
set val(chan) Channel/WirelessChannel
set val(prop) Propagation/TwoRayGround
set val(netif) Phy/WirelessPhy
set val(mac) Mac/802_11
set val(ifq) Queue/DropTail/PriQueue
set val(ll) LL
set val(ant) Antenna/OmniAntenna
set val(x) 500
set val(y) 400
set val(ifqlen) 50
set val(nn) 3
set val(stop) 60.0
set val(rp) AODV

set ns_ [new Simulator]
set tracefd [open prog7.tr w]
$ns_ trace-all $tracefd
set namtrace [open prog7.nam w]

$ns_ namtrace-all-wireless $namtrace $val(x) $val(y)
set prop [new $val(prop)]
set topo [new Topography]
$topo load_flatgrid $val(x) $val(y)
create-god $val(nn)

$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) \
        -channelType $val(chan) \
        -topoInstance $topo \
        -agentTrace ON \
        -routerTrace ON \
        -macTrace ON

for {set i 0} {$i < $val(nn)} {incr i} {
        set node_($i) [$ns_ node]
        $node_($i) random-motion 0
        }
```

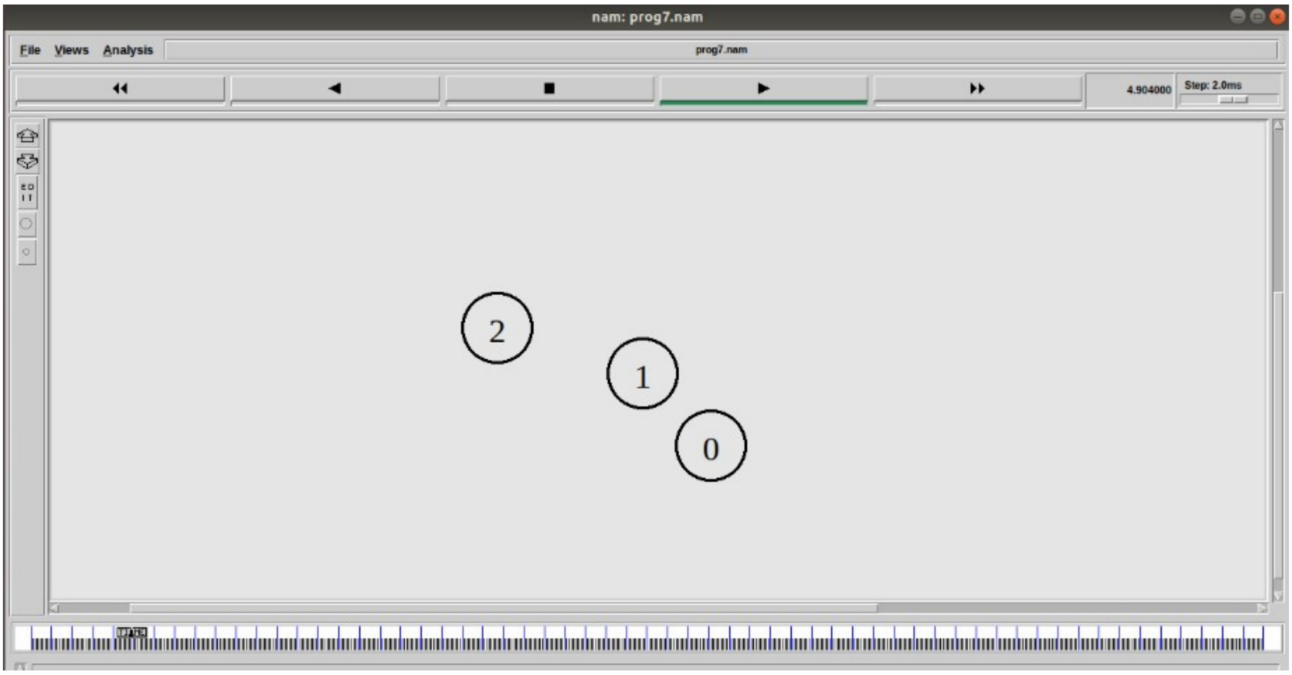
```
$node_(0) set x_ 5.0
$node_(0) set y_ 5.0
$node_(0) set z_ 0.0
$node_(1) set x_ 490.0
$node_(1) set y_ 285.0
$node_(1) set z_ 0.0
$node_(2) set x_ 150.0
$node_(2) set y_ 240.0
$node_(2) set z_ 0.0

for {set i 0} {$i < $val(nn)} {incr i} {
        $ns_ initial_node_pos $node_($i) 40
        }

$ns_ at 0.0 "$node_(0) setdest 450.0 285.0 30.0"
$ns_ at 0.0 "$node_(1) setdest 200.0 285.0 30.0"
$ns_ at 0.0 "$node_(2) setdest 1.0 285.0 30.0"

$ns_ at 25.0 "$node_(0) setdest 300.0 285.0 10.0"
$ns_ at 25.0 "$node_(2) setdest 100.0 285.0 10.0"

$ns_ at 40.0 "$node_(0) setdest 490.0 285.0 5.0"
$ns_ at 40.0 "$node_(2) setdest 1.0 285.0 5.0"

set tcp0 [new Agent/TCP]
set sink0 [new Agent/TCPSink]

$ns_ attach-agent $node_(0) $tcp0
$ns_ attach-agent $node_(2) $sink0
$ns_ connect $tcp0 $sink0

set ftp0 [new Application/FTP]
$ftp0 attach-agent $tcp0
$ns_ at 10.0 "$ftp0 start"

for {set i 0} {$i < $val(nn)} {incr i} {
        $ns_ at $val(stop) "$node_($i) reset";
        }

$ns_ at $val(stop) "puts \"NS EXITING..\"; $ns_ halt"
puts "starting sim....."

$ns_ run
```

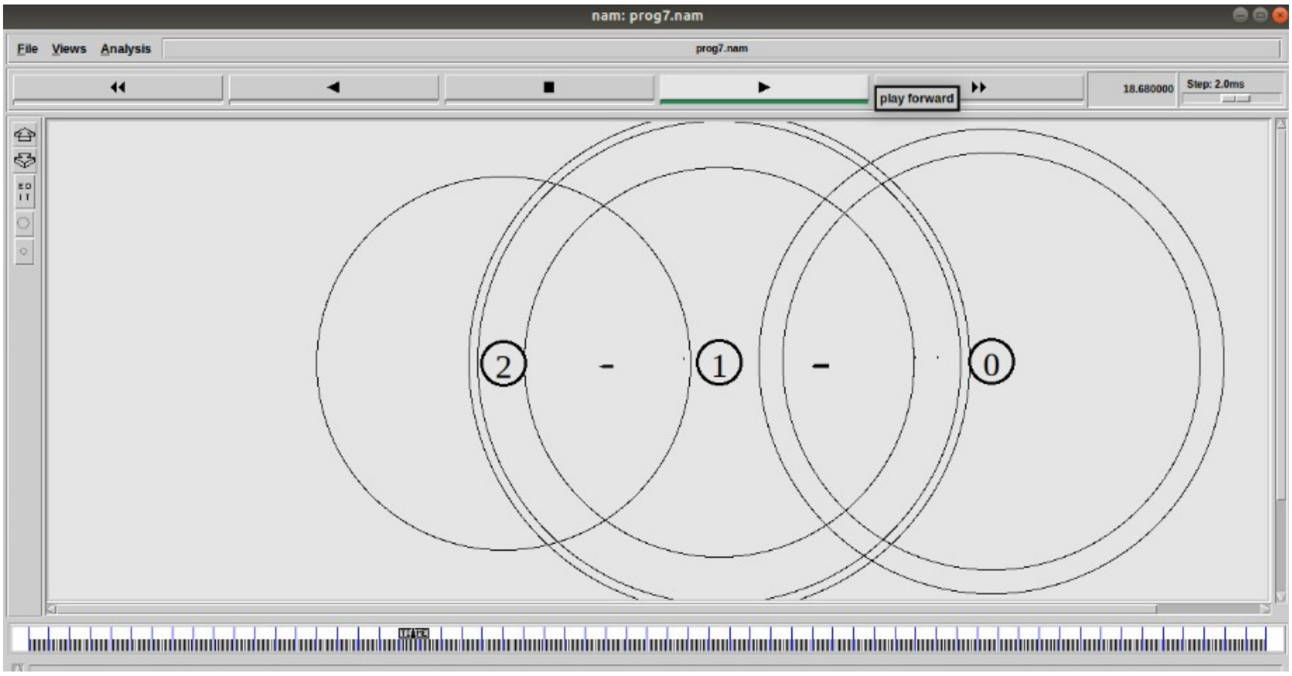
Execution commands :-

```
1) ns p7.tcl
2) nam prog7.nam
```

Outputs:-


nam: prog7.nam
File
Views
Analysis
prog7.nam
0.000000
Step: 2.0ms
0


nam: prog7.nam
File
Views
Analysis
prog7.nam
4.904000
Step: 2.0ms
2
1
0


nam: prog7.nam
File
Views
Analysis
prog7.nam
play forward
18.680000
Step: 2.0ms
2
1
0

8.**Set up a 25-node wireless network; analyze TCP performance when nodes are static and mobile.**

```
Mob file cmd : setdest -v 1 -n 25 -p 10 -M 10 -t 100 -x 500 -y 500 >mob
Static file cmd : ns cbrgen.tcl -type tcp -nn 25 -seed 1 -mc 10 -rate 10 >static
```

Save this file as p8.tcl :-

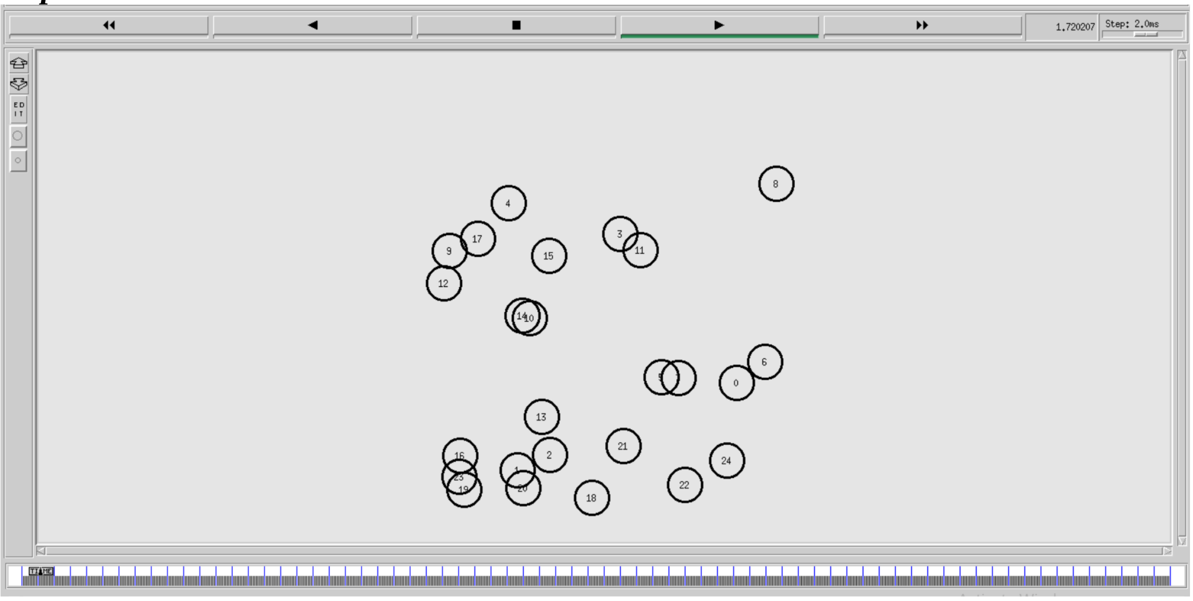
```
set val(chan) Channel/WirelessChannel
set val(prop) Propagation/TwoRayGround
set val(netif) Phy/WirelessPhy
set val(mac) Mac/802_11
set val(ifq) Queue/DropTail/PriQueue
set val(ll) LL
set val(ant) Antenna/OmniAntenna
set val(x) 500
set val(y) 500
set val(ifqlen) 50
set val(nn) 25
set val(stop) 100.0
set val(rp) AODV
set val(sc) "ns-allinone-2.35/ns-2.35/indep-utils/cmu-scen-gen/setdest/mob" #Mob file address
set val(cp) "ns-allinone-2.35/ns-2.35/indep-utils/cmu-scen-gen/static" #Static file address

set ns_ [new Simulator]
set tracefd [open 003.tr w]
$ns_ trace-all $tracefd
set namtrace [open 003.nam w]
$ns_ namtrace-all-wireless $namtrace $val(x) $val(y)

set prop [new $val(prop)]
set topo [new Topography]
$topo load_flatgrid $val(x) $val(y)

set god_ [create-god $val(nn)]

#Node Configuration
$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) \
-channelType $val(chan) \
-topoInstance $topo \
-agentTrace ON \
-routerTrace ON \
-macTrace ON
```

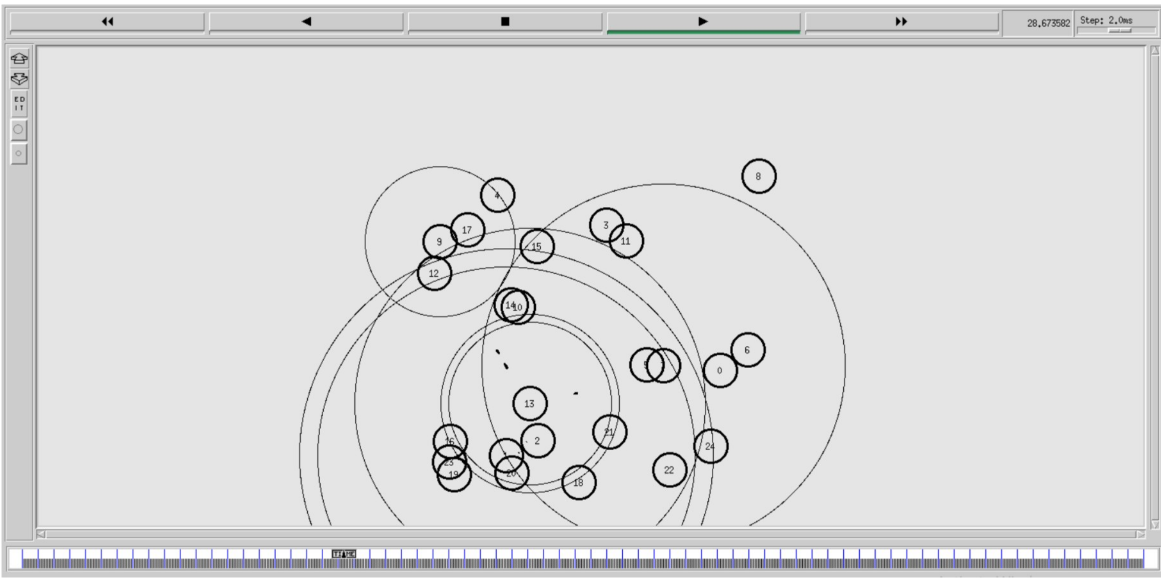
```
#Creating Nodes
for {set i 0} {$i < $val(nn) } {incr i} {
set node_($i) [$ns_ node]
$node_($i) random-motion 0
}

for {set i 0} {$i < $val(nn) } { incr i } {
set xx [expr rand()*500]
set yy [expr rand()*400]
$node_($i) set X_ $xx
$node_($i) set Y_ $yy
}

#Initial Positions of Nodes
for {set i 0} {$i < $val(nn)} {incr i} {
$ns_ initial_node_pos $node_($i) 40
}

#puts "Loading scenario file..."
#source $val(sc)
puts "Loading connection file..."
source $val(cp)

#Simulation Termination
for {set i 0} {$i < $val(nn) } {incr i} {
$ns_ at $val(stop) "$node_($i) reset";
}

$ns_ at $val(stop) "puts \"NS EXITING...\" ; $ns_ halt"
puts "Starting Simulation..."
$ns_ run
```

Execution Commands :-

```
1) ns p8.tcl
2) nam 003.nam
```

Output :-




28.673582
Step: 2.0ms
EDIT
8
4
17
9
3
11
15
12
14
10
6
5
0
13
21
16
2
24
23
22
19
20
18

9. **Write a TCL script to simulate the following scenario. Consider six nodes, (as shown in the figure below) moving within a flat topology of 700m x 700m. The initial positions of nodes are: n0 (150, 300), n1 (300, 500), n2(500, 500), n3 (300, 100), n4(500, 100) and n5(650, 300) respectively. A TCP connection is initiated between n0 (source) and n5(destination) through n3 and n4 i.e., the route is 0- 3-4-5. At time t = 3 seconds, the FTP application runs over it. After time t = 4 seconds, n3 (300,100) moves towards n1 (300, 500)with a speed of 5.0m/sec and after some time the path breaks. The data is then transmitted with a new path via n1 and n2 i.e., the new route is 0-1-2-5. The simulation lasts for 60 secs. In the above said case both the routes have equal cost. Use DSR as the routing protocol and the IEEE 802.11 MAC protocol.**

Save this file as p9.tcl :-

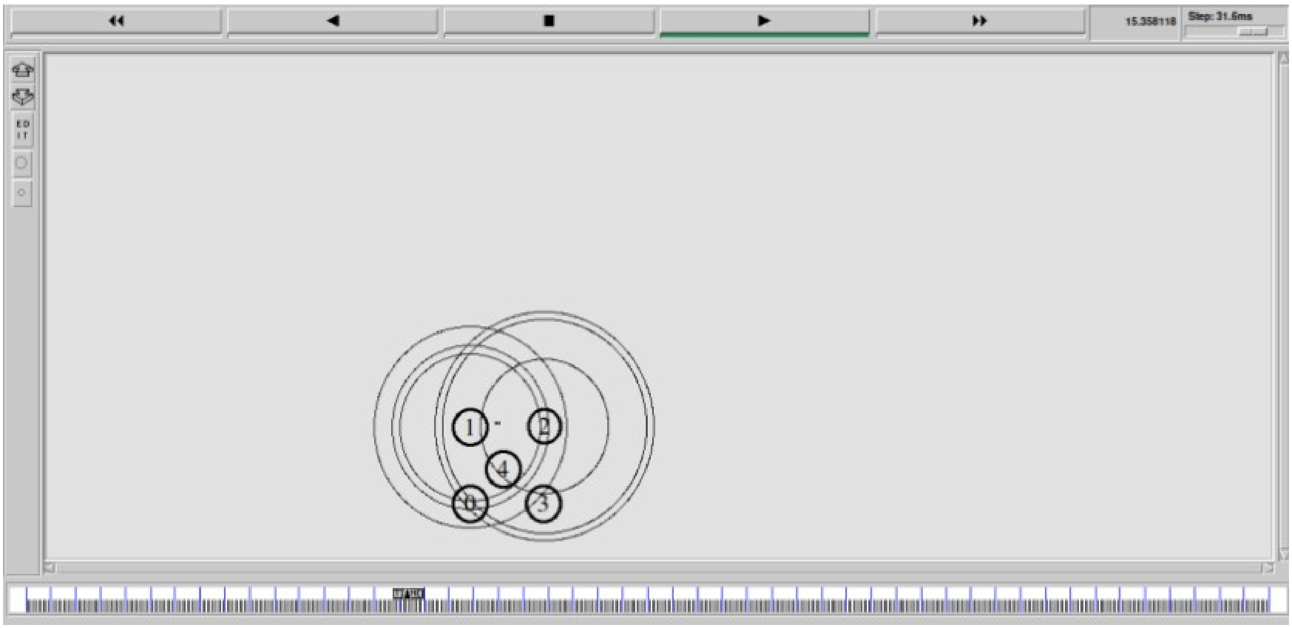
```
set val(chan) Channel/WirelessChannel
set val(prop) Propagation/TwoRayGround
set val(netif) Phy/WirelessPhy
set val(mac) Mac/802_11
#set val(ifq) Queue/DropTail/PriQueue
set val(ifq) CMUPriQueue
set val(ll) LL
set val(ant) Antenna/OmniAntenna
set val(x) 700
set val(y) 700
set val(ifqlen) 50
set val(nn) 6
set val(stop) 60.0
set val(rp) DSR

set ns_ [new Simulator]
set tracefd [open 004.tr w]
$ns_ trace-all $tracefd
set namtrace [open 004.nam w]
$ns_ namtrace-all-wireless $namtrace $val(x) $val(y)
set prop [new $val(prop)]
set topo [new Topography]
$topo load_flatgrid $val(x) $val(y)

set god_ [create-god $val(nn)]

#Node Configuration
$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) \
-channelType $val(chan) \
-topoInstance $topo \
-agentTrace ON \
-routerTrace ON \
-macTrace ON

#Creating Nodes
for {set i 0} {$i < $val(nn) } {incr i} {
set node_($i) [$ns_ node]
$node_($i) random-motion 0
}

#Initial Positions of Nodes
$node_(0) set X_ 150.0
$node_(0) set Y_ 300.0
$node_(0) set Z_ 0.0
$node_(1) set X_ 300.0
$node_(1) set Y_ 500.0
$node_(1) set Z_ 0.0
$node_(2) set X_ 500.0
$node_(2) set Y_ 500.0
$node_(2) set Z_ 0.0
$node_(3) set X_ 300.0
$node_(3) set Y_ 100.0
$node_(3) set Z_ 0.0
$node_(4) set X_ 500.0
$node_(4) set Y_ 100.0
$node_(4) set Z_ 0.0
$node_(5) set X_ 650.0
$node_(5) set Y_ 300.0
$node_(5) set Z_ 0.0
for {set i 0} {$i < $val(nn)} {incr i} {
$ns_ initial_node_pos $node_($i) 40
}

#Topology Design
$ns_ at 1.0 "$node_(0) setdest 160.0 300.0 2.0"
$ns_ at 1.0 "$node_(1) setdest 310.0 150.0 2.0"
$ns_ at 1.0 "$node_(2) setdest 490.0 490.0 2.0"
$ns_ at 1.0 "$node_(3) setdest 300.0 120.0 2.0"
$ns_ at 1.0 "$node_(4) setdest 510.0 90.0 2.0"
$ns_ at 1.0 "$node_(5) setdest 640.0 290.0 2.0"
$ns_ at 4.0 "$node_(3) setdest 300.0 500.0 5.0"

#Generating Traffic
set tcp0 [new Agent/TCP]
set sink0 [new Agent/TCPSink]
$ns_ attach-agent $node_(0) $tcp0
$ns_ attach-agent $node_(5) $sink0
$ns_ connect $tcp0 $sink0

set ftp0 [new Application/FTP]
$ftp0 attach-agent $tcp0
```

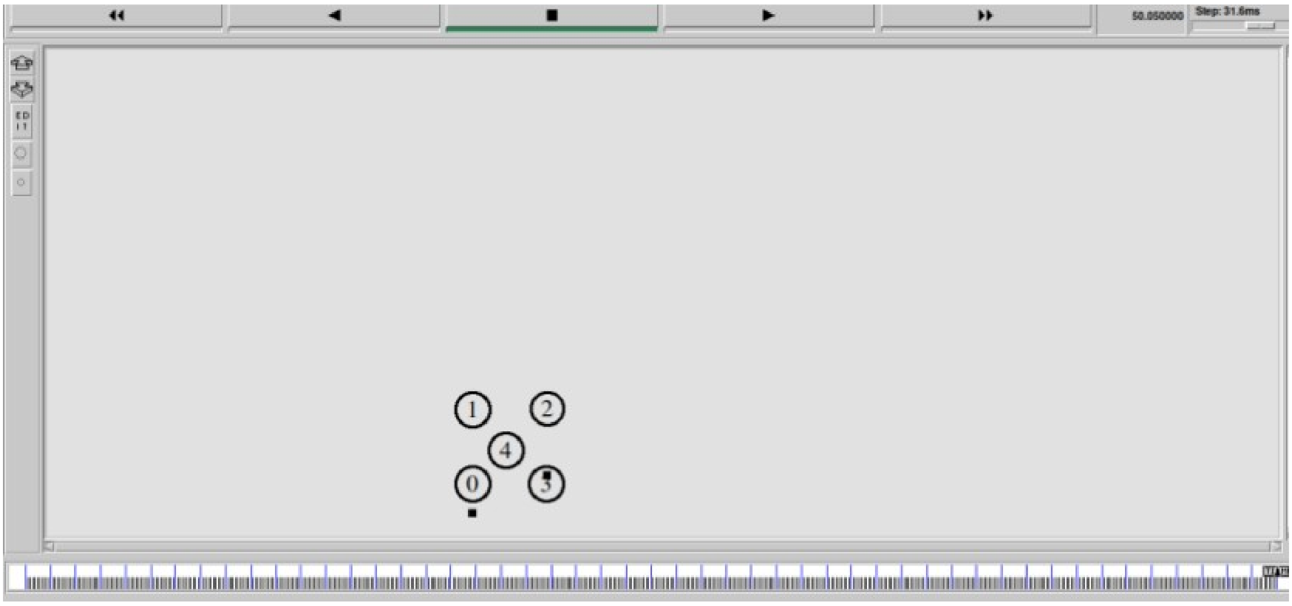
```
$ns_ at 5.0 "$ftp0 start"
$ns_ at 60.0 "$ftp0 stop"

#Simulation Termination
for {set i 0} {$i < $val(nn) } {incr i} {
$ns_ at $val(stop) "$node_($i) reset";
}

$ns_ at $val(stop) "puts \"NS EXITING...\" ; $ns_ halt"
puts "Starting Simulation..."
$ns_ run
```

Execution Commands :-

1) ns p9.tcl
2) nam 004.nam

Output:-





10. **Set up a wireless network with mobile nodes, induce 1 to 10% error to the network using a uniform error model. Plot the congestion window for TCP connections.Write your observation on TCP performance as error increases in the network.**

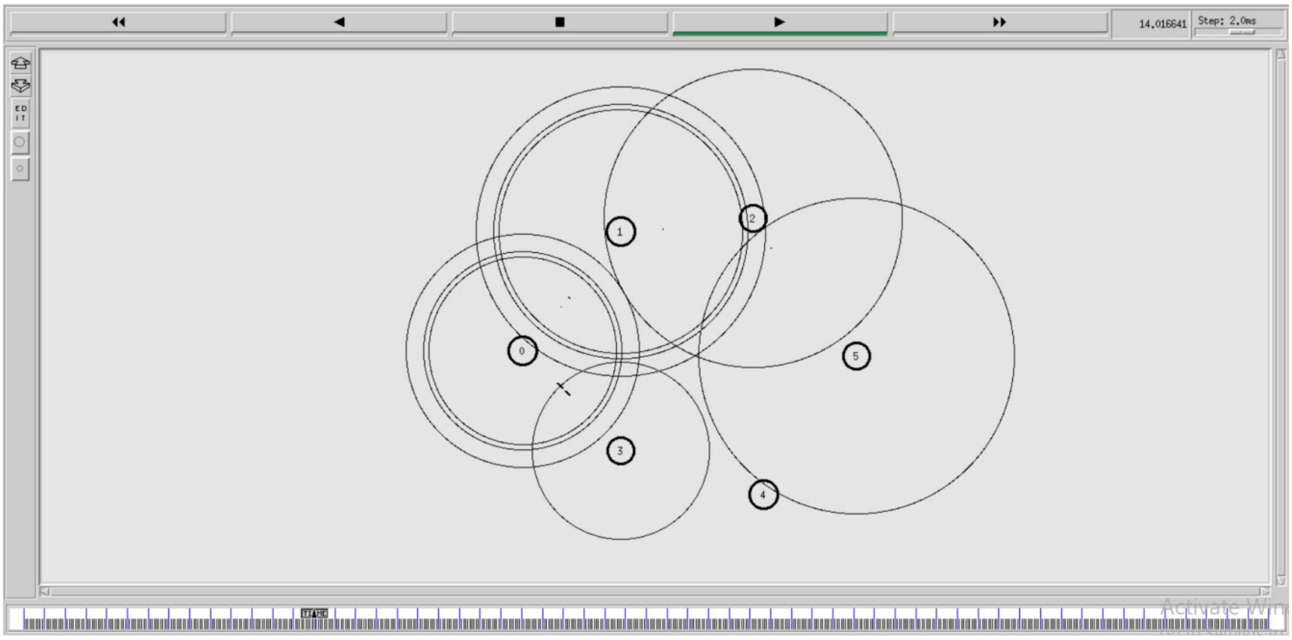
Save this file as p10.tcl :-

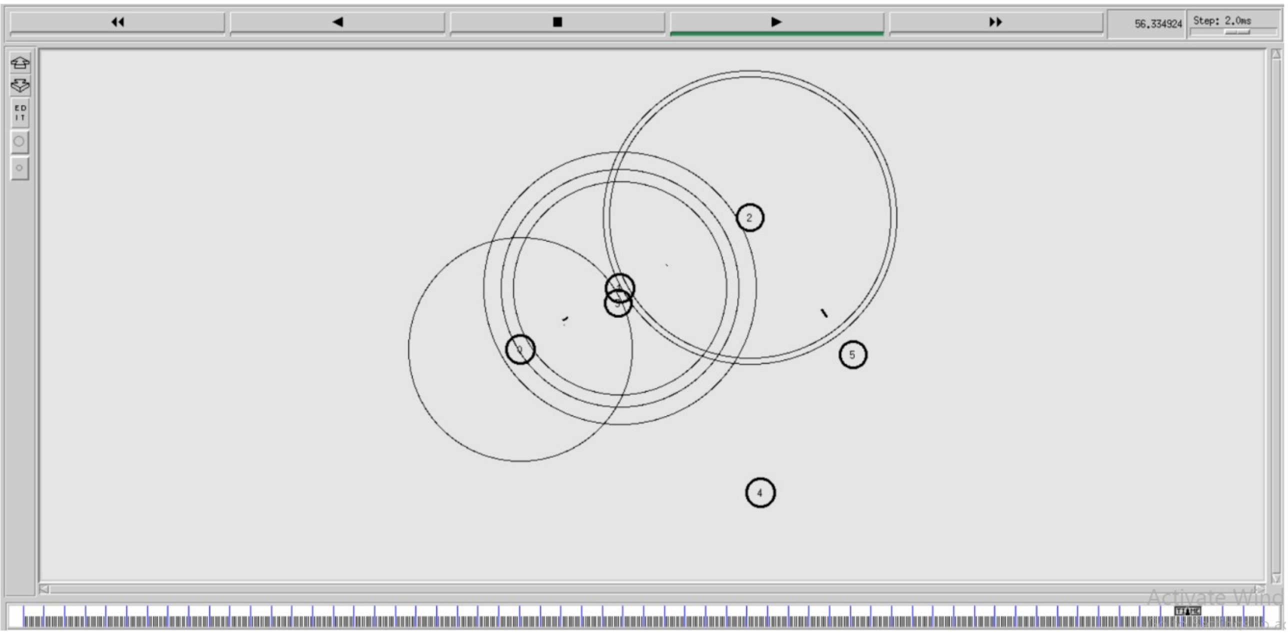
```
set val(chan) Channel/WirelessChannel
set val(prop) Propagation/TwoRayGround
set val(netif) Phy/WirelessPhy
set val(mac) Mac/802_11
set val(ifq) Queue/DropTail/PriQueue
set val(ll) LL
set val(ant) Antenna/OmniAntenna
set val(x) 500
set val(y) 500
set val(ifqlen) 50
set val(nn) 5
set val(stop) 50.0
set val(rp) AODV
set ns_ [new Simulator]
set tracefd [open 006.tr w]
$ns_ trace-all $tracefd
set namtrace [open 006.nam w]
$ns_ namtrace-all-wireless $namtrace $val(x) $val(y)
set prop [new $val(prop)]
set topo [new Topography]
$topo load_flatgrid $val(x) $val(y)
create-god $val(nn)
#Node Configuration
$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) \
-channelType $val(chan) \
-topoInstance $topo \
-agentTrace ON \
-routerTrace ON \
-macTrace ON \
-IncomingErrProc "uniformErr" \
-OutgoingErrProc "uniformErr"
proc uniformErr {} {
set err [new ErrorModel]
$err unit pkt
$err set rate_ 0.01
return $err
}
#Creating Nodes
for {set i 0} {$i < $val(nn) } {incr i} {
set node_($i) [$ns_ node]
$node_($i) random-motion 0
}
#Initial Positions of Nodes
for {set i 0} {$i < $val(nn)} {incr i} {
$ns_ initial_node_pos $node_($i) 40
}
#Topology Design
$ns_ at 1.0 "$node_(0) setdest 10.0 10.0 50.0"
$ns_ at 1.0 "$node_(1) setdest 10.0 100.0 50.0"
$ns_ at 1.0 "$node_(4) setdest 50.0 50.0 50.0"
$ns_ at 1.0 "$node_(2) setdest 100.0 100.0 50.0"
$ns_ at 1.0 "$node_(3) setdest 100.0 10.0 50.0"
#Generating Traffic
set tcp0 [new Agent/TCP]
set sink0 [new Agent/TCPSink]
$ns_ attach-agent $node_(0) $tcp0
$ns_ attach-agent $node_(2) $sink0
$ns_ connect $tcp0 $sink0
set ftp0 [new Application/FTP]
$ftp0 attach-agent $tcp0
$ns_ at 1.0 "$ftp0 start"
$ns_ at 50.0 "$ftp0 stop"
set tcp1 [new Agent/TCP]
set sink1 [new Agent/TCPSink]
$ns_ attach-agent $node_(1) $tcp1
$ns_ attach-agent $node_(2) $sink1
$ns_ connect $tcp1 $sink1
set ftp1 [new Application/FTP]
$ftp1 attach-agent $tcp1
$ns_ at 1.0 "$ftp1 start"
$ns_ at 50.0 "$ftp1 stop"
#Simulation Termination
for {set i 0} {$i < $val(nn) } {incr i} {
$ns_ at $val(stop) "$node_($i) reset";
}
$ns_ at $val(stop) "puts \"NS EXITING...\" ; $ns_ halt"
puts "Starting Simulation..."
$ns_ run
```

Execution Commands:-

```
1) ns p10.tcl
2) nam 006.nam
```

Output:-


14.016641
Step: 2.0ms
EDIT
1
2
0
5
3
4


56.334924
Step: 2.0ms
EDIT
2
1
3
0
5
4