```tcl


# 6. Set up 2-node wireless network. Analyse FTP performance
# for this scenario with DSDV protocol.

set val(chna) Channel/WirelessChannel
set val(prop) Propagation/TwoRayGround
set val(netif) Phy/WirelessPhy
set val(ant) Antenna/OmniAntenna
set val(mac) Mac/802_11
set val(ll) LL              #Logical Link layer
set val(nn) 2
set val(x) 500
set val(y) 500
set val(ifq) Queue/DropTail/PriQueue
set val(ifqLen) 50
set val(stop) 60.0
set val(rp) DSDV        #Destination Sequence Dist Vector

set ns_ [new Simulator]
set tracefd [open ex6.tr w]
$ns_ trace-all $tracefd
set namtrace [open ex6.nam w]
$ns_ nmatrace-all-wireless $nmatrace $val(x) $val(y)

set prop [new $val(prop)]
set topo [new Topography]
$topo load_flatgrid $val(x) $val(y)
create-god $val(nn)     #General operations directory/discription

#Node configuration
$ns_ node-config -adhocRouting $val(rp) \
                 -channelType $val(chan) \
                 -propType $val(prop) \
                 -phyType $val(netif) \
                 -antType $val(ant) \
                 -macType $val(mac) \
                 -llType $val(ll) \
                 -ifqType $val(ifq) \
                 -ifqLen $val(ifqlen) \

                 -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   #=> initially stagnent, not mobile
```

```
}

#Initialising postions of nodes
for {set i 0} {$i < $val(nn)} {incr i} {
    $ns_ initial_node_pos $node_($i) 40     #size of the node
}

#Topology Design
                #for mobility   x     y  speed
$ns_ at 1.1 "$node_(0) setdest 310.0 10.0 20.0"
$ns_ at 1.1 "$node_(1) setdest 10.0 310.0 20.0"

#Generating Traffic
set tcp [new Agent/TCP]
set sink [new Agent/TCPSink]
set ftp [new Application/FTP]
$ns_ attach-agent $node_(0) $tcp
$ns_ attach-agent $node_(1) $sink
$ns_ connect $tcp $sink
$ftp attach-agent $tcp

$ns_ at 1.0 "$ftp start"
$ns_ at 20.0 "$ftp 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..."
exec nam ex6.nam &
$ns_ run



# 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.

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

```
set val(ifqlen) 50
set val(stop) 60.0
set val(rp) AODV        #Adhoc On demand Dist Vector

set ns_ [new Simulator]
set tracefd [open ex7.tr w]
$ns_ trace-all $tracefd
set namtrace [open ex7.nam w]
$ns_ namtrace-all-wireless $nmatrace $val(x) $val(y)

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

$ns_ node-config -adhocRouter $val(rp)\
                 -channelType $val(chan)\
                 -propType $val(prop)\
                 -phyType $val(phy)\
                 -macType $val(mac)
                 -llType $val(ll)\
                 -ifqType $val(ifq)\
                 -ifqLen $val(ifqlen)\

                 -topoInstace $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
$ndoe_(1) set y_ 290.0
$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
}

```

```
#                      2     1     0

$ns_ at 0.0 "$node_(0) setdest 450.0 290.0 30.0"
$ns_ at 0.0 "$node_(1) setdest 200.0 290.0 30.0"
$ns_ at 0.0 "$node_(2) setdest 1.0 290.0 30.0"

#                         2  1  0

$ns_ at 25.0 "$node_(0) setdest 300.0 290.0 10.0"
$ns_ at 25.0 "$node_(2) setdest 100.0 290.0 10.0"

#                      2       1         0

$ns_ at 40.0 "$node_(0) setdest 490.0 290.0 5.0"
$ns_ at 40.0 "$node_(2) setdest 1.0 290.0 5.0"

set tcp [new Agent/TCP]
set sink [new Agent/TCPSink]
set ftp [new Appliaction/FTP]
$ns_ attach-agent $node_(0) $tcp
$ns_ attach-agent $node_(2) $sink
$ns_ connect $tcp $sink
$ftp attach-agent $tcp

$ns_ at 10.0 "$ftp 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 Simulation..."
exec nam ex7.nam &
$ns_ run



# 8. Set up a 26-node wireless network. Analyze TCO
# performance when nodes are static and dynamic


set val(chan) Channel/WirelessChannel
set val(prop) Propagation/TwoRayGround
set val(netif) Phy/WirelessPhy
set val(ant) Antenna/OmniAntenna
set val(mac) Mac/802_11
set val(ll) LL
set val(nn) 25
set val(x) 500
set val(y) 500
set val(ifq) Queue/DropTail/PriQueue
```

```
set val(ifqlen) 50
set val(stop) 60.0
set val(rp) AODV        #Adhoc On demand Dist Vector

set val(st) "/home/student/ns-allinone-2.35/ns-2.35/indep-utils/cmu-scen-gen/static_8"
set val(mo) "/home/student/ns-allinone-2.35/ns-2.35/indep-utils/cmu-scen-gen/setdest/mobility_8"

set ns_ [new Simualtor]
set tracefd [open ex8.tr w]
$ns_ trace-all $tracefd
set nf [open ex8.nam w]
$ns_ namtrace-all-wireless $nf $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)]

$ns_ node-config -adhocRouter $val(rp)\
                 -channelType $val(chan)\
                 -propType $val(prop)\
                 -phyType $val(phy)\
                 -macType $val(mac)
                 -llType $val(ll)\
                 -ifqType $val(ifq)\
                 -ifqLen $val(ifqlen)\

                 -topoInstace $topo\
                 -agentTrace ON\
                 -routerTrace ON\
                 -macTrace ON

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

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

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

puts "Loading scenario file... -mobility"
source $val(mo)
puts "Loading scenario filw... traffic"
```

```
source $val(st)

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..."
exec nam ex8.nam &
$ns_ run


###
gedit ex8.tcl
cd ns-allinone-2.35/ns-2.35/indep-utils/cmu-scen-gen/
ls
ns static_8
ns cbrgen.tcl
ns cbrgen.tcl -type tcp -nn 25 -seed 1 -mc 20 -rate 50 > static_8
cd setdest
setdest -v 1 -n 25 -p 0.5 -M 40 -t 100 -x 500 -y 500 > mobility_8
cd              #comes put of all dorectories
gedit ex8.tcl
ns ex8.tcl
###



# 9. 6 nodes, moving within a flat topology of 700m x 700m.
# Initial node positions: n0(150,300),n1(300,500),n2(500,500),n3(300,100),n4(500,100),n5(650,300)
# A TCP connection - initiated between n0 (source), n5 (destination) thro' n3 and n4. Route: 0-3-4-5.
# At t = 3 secs, the FTP application runs over it.
# After time t = 4 seconds, n3(300,100) moves towards n1(300,500) with speed of 5.0 m/sec
# after some time the path breaks. The data - 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.

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

```
307
308  set tracefd [open ex9.tr w]
309  $ns_ trace-all $tracefd
310  set namtrace [open ex9.nam w]
311  $ns_ namtrace-all-wireless $namtrace $val(x) $val(y)
312
313  set prop [new $val(prop)]
314  set topo [new Topography]
315  $topo load_flatgrid $val(x) $val(y)
316  set god_ [create-god $val(nn)]
317
318  $ns_ node-config -adhocRouter $val(rp)\
319                   -channelType $val(chan)\
320                   -propType $val(prop)\
321                   -phyType $val(phy)\
322                   -macType $val(mac)
323                   -llType $val(ll)\
324                   -ifqType $val(ifq)\
325                   -ifqLen $val(ifqlen)\
326
327                   -topoInstace $topo\
328                   -agentTrace ON\
329                   -routerTrace ON\
330                   -macTrace ON
331
332  for {set i 0} {$i < $val(nn)} {incr i} {
333      set node_($i) [$ns_ node]
334      $node_(i) ranodm-motion 0
335  }
336  #Initial Positions of Nodes
337              1    2
338          0            5
339              3    4
340
341  $node_(0) set x_ 150.0
342  $node_(0) set y_ 300.0
343  $node_(0) set z_ 0.0
344
345  $node_(1) set x_ 300.0
346  $node_(1) set y_ 500.0
347  $node_(1) set z_ 0.0
348
349  $node_(2) set x_ 500.0
350  $node_(2) set y_ 500.0
351  $node_(2) set z_ 0.0
352
353  $node_(3) set x_ 300.0
354  $node_(3) set y_ 300.0
355  $node_(3) set z_ 0.0
356
357  $node_(4) set x_ 500.0
```

```
$node_(4) set y_ 100.0
$node_(4) set z_ 0.0

$node_(5) set x_ 650.
$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
}

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

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

$ns_ at 3.0 "$ftp start"
$ns_ at 60.0 "$ftp 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..."
exec nam "ex9.nam" &
$ns_ run



# 10. Mobile nodes. Induce 1 to 10% error using Uniform Error MOdel.
# Plot conjestion window for TCP connection.

set val(chan) Channel/WirelessChannel
set val(prop) Propagation/TwoRayGround
set val(netif) Phy/WirelessPhy
set val(ant) Antenna/OmniAntenna
set val(mac) Mac/802_11
set val(ll) LL
set val(nn) 5
```

```
set val(x) 500
set val(y) 500
set val(ifq) Queue/DropTail/PriQueue
set val(ifqlen) 20
set val(stop) 50.0
set val(rp) AODV        #Adhoc On demand Dist Vector

set ns_ [new Simulator]
set tf [open ex10.tr w]
$ns_ trace-all $tf
set nf [open ex10.nam w]
$ns_ namtrace-all-wireless $nf $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 -adhocRouter $val(rp)\
                 -channelType $val(chan)\
                 -propType $val(prop)\
                 -phyType $val(phy)\
                 -macType $val(mac)
                 -llType $val(ll)\
                 -ifqType $val(ifq)\
                 -ifqLen $val(ifqlen)\

                 -topoInstace $topo\
                 -agentTrace ON\
                 -routerTrace ON\
                 -macTrace ON


proc uniformErr {} {
    set err [new ErrorMode]
    $err unit pkt
    $err set rate_ 0.01
    rteurn $err
}

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
}

    1       2
        4
```

```
     0       3

$ns_ at 1.0 "$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"

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"

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..."
exec nam "ex10.nam" &
$ns_ run
```