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

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

#Define a 'finish' procedure
proc finish {} {
global ns nf
$ns flush-trace
#Close the trace file
close $nf
#Execute nam on the trace file
exec nam out.nam &
exit 0
}

#Create five nodes
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]
set n4 [$ns node]

#CreateLan between the nodes
set lan0 [$ns newLan "$n0 $n1 $n2 $n3 $n4" 0.5Mb 40ms LL Queue/DropTail
MAC/Csma/Cd Channel]

#Create a TCP agent and attach it to node n0
set tcp0 [new Agent/TCP]
$tcp0 set class_ 1
$ns attach-agent $n1 $tcp0

#Create a TCP Sink agent (a traffic sink) for TCP and attach it to node n3
set sink0 [new Agent/TCPSink]
$ns attach-agent $n3 $sink0

#Connect the traffic sources with the traffic sink
$ns connect $tcp0 $sink0

# Create a CBR traffic source and attach it to tcp0
set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.01
$cbr0 attach-agent $tcp0

#Schedule events for the CBR agents
$ns at 0.5 "$cbr0 start"
$ns at 4.5 "$cbr0 stop"
```

```
#Call the finish procedure after 5 seconds of simulation time
$ns at 5.0 "finish"

#Run the simulation
$ns run
```

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

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

#Define a 'finish' procedure
proc finish {} {
global ns nf
$ns flush-trace
#Close the trace file
close $nf
#Execute nam on the trace file
exec nam out.nam &
exit 0
}

#Create five nodes
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]
set n4 [$ns node]
set n5 [$ns node]

#Create links between the nodes
$ns duplex-link $n0 $n1 1Mb 10ms DropTail
$ns duplex-link $n1 $n2 1Mb 10ms DropTail
$ns duplex-link $n2 $n3 1Mb 10ms DropTail
$ns duplex-link $n3 $n4 1Mb 10ms DropTail
$ns duplex-link $n4 $n5 1Mb 10ms DropTail
$ns duplex-link $n5 $n0 1Mb 10ms DropTail

#Create a TCP agent and attach it to node n0
set tcp0 [new Agent/TCP]
$tcp0 set class_ 1
$ns attach-agent $n1 $tcp0

#Create a TCP Sink agent (a traffic sink) for TCP and attach it to node n3
set sink0 [new Agent/TCPSink]
$ns attach-agent $n3 $sink0

#Connect the traffic sources with the traffic sink
$ns connect $tcp0 $sink0

# Create a CBR traffic source and attach it to tcp0
set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.01
$cbr0 attach-agent $tcp0
```

```
#Schedule events for the CBR agents
$ns at 0.5 "$cbr0 start"
$ns at 4.5 "$cbr0 stop"


#Call the finish procedure after 5 seconds of simulation time
$ns at 5.0 "finish"

#Run the simulation
$ns run
```

ex9_star

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



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

#Define a 'finish' procedure
proc finish {} {
global ns nf
$ns flush-trace
#Close the trace file
close $nf
#Executenam on the trace file
exec nam out.nam &
exit0
}
#Create six nodes
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]
set n4 [$ns node]
set n5 [$ns node]

#Change the shape of center node in a star topology
$n0 shape square

#Create links between the nodes
$ns duplex-link $n0 $n1 1Mb 10ms DropTail
$ns duplex-link $n0 $n2 1Mb 10ms DropTail
$ns duplex-link $n0 $n3 1Mb 10ms DropTail
$ns duplex-link $n0 $n4 1Mb 10ms DropTail
$ns duplex-link $n0 $n5 1Mb 10ms DropTail

#Create a TCP agent and attach it to node n0
set tcp0 [new Agent/TCP]
$tcp0 set class_ 1
$ns attach-agent $n1 $tcp0

#Create a TCP Sink agent (a traffic sink) for TCP and attach it to node n3
set sink0 [new Agent/TCPSink]
$ns attach-agent $n3 $sink0

#Connect the traffic sources with the traffic sink
$ns connect $tcp0 $sink0

# Create a CBR traffic source and attach it to tcp0 set cbr0 [new
Application/Traffic/CBR]
```

```
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.05
$cbr0 attach-agent $tcp0

#Schedule events for the CBR agents
$ns at 0.5 "$cbr0 start"
$ns at 4.5 "$cbr0 stop"

#Call the finish procedure after 5 seconds of simulation time
$ns at 5.0 "finish"

#Run the simulation
$ns run
```

Go-Back-N

```
#send packets one by one
set ns [new Simulator]

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 color "purple"
$n1 color "purple"
$n2 color "violet"
$n3 color "violet"
$n4 color "chocolate"
$n5 color "chocolate"

$n0 shape box ;
$n1 shape box ;
$n2 shape box ;
$n3 shape box ;
$n4 shape box ;
$n5 shape box ;

$ns at 0.0 "$n0 label SYS0"
$ns at 0.0 "$n1 label SYS1"
$ns at 0.0 "$n2 label SYS2"
$ns at 0.0 "$n3 label SYS3"
$ns at 0.0 "$n4 label SYS4"
$ns at 0.0 "$n5 label SYS5"

set nf [open goback.nam w]
$ns namtrace-all $nf
set f [open goback.tr w]
$ns trace-all $f

$ns duplex-link $n0 $n2 1Mb 20ms DropTail
$ns duplex-link-op $n0 $n2 orient right-down
$ns queue-limit $n0 $n2 5
$ns duplex-link $n1 $n2 1Mb 20ms DropTail
$ns duplex-link-op $n1 $n2 orient right-up
$ns duplex-link $n2 $n3 1Mb 20ms DropTail
$ns duplex-link-op $n2 $n3 orient right
$ns duplex-link $n3 $n4 1Mb 20ms DropTail
$ns duplex-link-op $n3 $n4 orient right-up
$ns duplex-link $n3 $n5 1Mb 20ms DropTail
$ns duplex-link-op $n3 $n5 orient right-down

Agent/TCP  set_nam_tracevar_true

set tcp [new Agent/TCP]
$tcp set fid 1
$ns attach-agent $n1 $tcp
set sink [new Agent/TCPSink]
$ns attach-agent $n4 $sink
$ns connect $tcp $sink
set ftp [new Application/FTP]
```

```
$ftp attach-agent $tcp

$ns at 0.05 "$ftp start"
$ns at 0.06 "$tcp set windowInit 6"
$ns at 0.06 "$tcp set maxcwnd 6"
$ns at 0.25 "$ns queue-limit $n3 $n4 0"
$ns at 0.26 "$ns queue-limit $n3 $n4 10"
$ns at 0.305 "$tcp set windowInit 4"
$ns at 0.305 "$tcp set maxcwnd 4"
$ns at 0.368 "$ns detach-agent $n1 $tcp ; $ns detach-agent $n4
$sink"
$ns at 1.5 "finish"
$ns at 0.0 "$ns trace-annotate \"Goback N end\""
$ns at 0.05 "$ns trace-annotate \"FTP starts at 0.01\""
$ns at 0.06 "$ns trace-annotate \"Send 6Packets from SYS1 to
SYS4\""
$ns at 0.26 "$ns trace-annotate \"Error Occurs for 4th packet
so not sent ack for the Packet\""
$ns at 0.30 "$ns trace-annotate \"Retransmit Packet_4 to 6\""
$ns at 1.0 "$ns trace-annotate \"FTP stops\""

proc finish {} {
global ns nf
$ns flush-trace
close $nf
puts "filtering..."
#exec tclsh../bin/namfilter.tcl goback.nam
#puts "running nam..."
exec nam goback.nam &
exit 0
}

$ns run
```

Selective-Repeat-

```
#send packets one by one
set ns [new Simulator]

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 color "red"
$n1 color "red"
$n2 color "green"
$n3 color "green"
$n4 color "black"
$n5 color "black"

$n0 shape circle ;
$n1 shape circle ;
$n2 shape circle ;
$n3 shape circle ;
$n4 shape circle ;
$n5 shape circle ;

$ns at 0.0 "$n0 label SYS1"
$ns at 0.0 "$n1 label SYS2"
$ns at 0.0 "$n2 label SYS3"
$ns at 0.0 "$n3 label SYS4"
$ns at 0.0 "$n4 label SYS5"
$ns at 0.0 "$n5 label SYS6"

set nf [open Srepeat.nam w]
$ns namtrace-all $nf
set f [open Srepeat.tr w]
$ns trace-all $f

$ns duplex-link $n0 $n2 1Mb 10ms DropTail
$ns duplex-link-op $n0 $n2 orient right-down
$ns queue-limit $n0 $n2 5
$ns duplex-link $n1 $n2 1Mb 10ms DropTail
$ns duplex-link-op $n1 $n2 orient right-up
$ns duplex-link $n2 $n3 1Mb 10ms DropTail
$ns duplex-link-op $n2 $n3 orient right
$ns duplex-link $n3 $n4 1Mb 10ms DropTail
$ns duplex-link-op $n3 $n4 orient right-up
$ns duplex-link $n3 $n5 1Mb 10ms DropTail
$ns duplex-link-op $n3 $n5 orient right-down

Agent/TCP set_nam_tracevar_true

set tcp [new Agent/TCP]
$tcp set fid 1
$ns attach-agent $n1 $tcp
set sink [new Agent/TCPSink]
$ns attach-agent $n4 $sink
$ns connect $tcp $sink
set ftp [new Application/FTP]
```

```
$ftp attach-agent $tcp

$ns at 0.05 "$ftp start"
$ns at 0.06 "$tcp set windowInit 8"
$ns at 0.06 "$tcp set maxcwnd 8"
$ns at 0.25 "$ns queue-limit $n3 $n4 0"
$ns at 0.26 "$ns queue-limit $n3 $n4 10"
$ns at 0.30 "$tcp set windowInit 1"
$ns at 0.30 "$tcp set maxcwnd 1"
$ns at 0.30 "$ns queue-limit $n3 $n4 10"
$ns at 0.47 "$ns detach-agent $n1 $tcp;$ns detach-agent $n4
$sink"
$ns at 1.75 "finish"
$ns at 0.0 "$ns trace-annotate \"Select and repeat\""
$ns at 0.05 "$ns trace-annotate \"FTP starts at 0.01\""
$ns at 0.06 "$ns trace-annotate \"Send 8Packets from SYS1 to
SYS4\""
$ns at 0.26 "$ns trace-annotate \"Error Occurs in 4th packet
\""
$ns at 0.30 "$ns trace-annotate \"Retransmit Packet_4 from
SYS1 to SYS4\""
$ns at 1.5 "$ns trace-annotate \"FTP stops\""

proc finish {} {
global ns nf
$ns flush-trace
close $nf
puts "filtering..."
#exec tclsh../bin/namfilter.tcl srepeat.nam
#puts "running nam..."
exec nam Srepeat.nam &
exit 0
}

$ns run
```

Ex 11 - TCP

```
set ns [new Simulator]

set nf [open out.nam w]
$ns namtrace-all $nf

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

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

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

$ns duplex-link $n0 $n1 10Mb 10ms DropTail
$ns duplex-link $n1 $n3 10Mb 10ms DropTail
$ns duplex-link $n2 $n1 10Mb 10ms DropTail
$ns duplex-link-op $n0 $n1 orient right-down
$ns duplex-link-op $n1 $n3 orient right
$ns duplex-link-op $n2 $n1 orient right-up

set tcp [new Agent/TCP]
$ns attach-agent $n0 $tcp

set ftp [new Application/FTP]
$ftp attach-agent $tcp

set sink [new Agent/TCPSink]
$ns attach-agent $n3 $sink

set udp [new Agent/UDP]
$ns attach-agent $n2 $udp

set cbr [new Application/Traffic/CBR]
$cbr attach-agent $udp

set null [new Agent/Null]
$ns attach-agent $n3 $null

$ns connect $tcp $sink
$ns connect $udp $null

$ns rtmodel-at 1.0 down $n1 $n3
$ns rtmodel-at 2.0 up $n1 $n3

$ns rtproto DV
$ns at 0.0 "$ftp start"
$ns at 0.0 "$cbr start"
```

```
$ns at 5.0 "finish"
$ns run
```

DV Tcl

```
set ns [new Simulator]
set nr [open thro.tr w]

$ns trace-all $nr

set nf [open thro.nam w]
$ns namtrace-all $nf

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

for { set i 0 } { $i< 12} { incr i 1 } {
set n($i) [$ns node]}

for {set i 0} {$i< 8} {incr i} {
$ns duplex-link $n($i) $n([expr $i+1]) 1Mb 10ms DropTail }
$ns duplex-link $n(0) $n(8) 1Mb 10ms DropTail
$ns duplex-link $n(1) $n(10) 1Mb 10ms DropTail
$ns duplex-link $n(0) $n(9) 1Mb 10ms DropTail
$ns duplex-link $n(9) $n(11) 1Mb 10ms DropTail
$ns duplex-link $n(10) $n(11) 1Mb 10ms DropTail
$ns duplex-link $n(11) $n(5) 1Mb 10ms DropTail

set udp0 [new Agent/UDP]
$ns attach-agent $n(0) $udp0
set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.005
$cbr0 attach-agent $udp0
set null0 [new Agent/Null]
$ns attach-agent $n(5) $null0

$ns connect $udp0 $null0
set udp1 [new Agent/UDP]

$ns attach-agent $n(1) $udp1
set cbr1 [new Application/Traffic/CBR]

$cbr1 set packetSize_ 500
$cbr1 set interval_ 0.005
$cbr1 attach-agent $udp1

set null0 [new Agent/Null]
$ns attach-agent $n(5) $null0
$ns connect $udp1 $null0

$ns rtproto DV

$ns rtmodel-at 10.0 down $n(11) $n(5)
$ns rtmodel-at 15.0 down $n(7) $n(6)
$ns rtmodel-at 30.0 up $n(11) $n(5)
```

```
$ns rtmodel-at 20.0 up $n(7) $n(6)

$udp0 set fid_ 1
$udp1 set fid_ 2

$ns color 1 Red
$ns color 2 Green

$ns at 1.0 "$cbr0 start"
$ns at 2.0 "$cbr1 start"
$ns at 45 "finish"

$ns run
```

```
set ns [new Simulator]
set nr [open thro.tr w]

$ns trace-all $nr
set nf [open thro.nam w]
$ns namtrace-all $nf

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

for { set i 0 } { $i< 12} { incr i 1 } {
set n($i) [$ns node]}

for {set i 0} {$i< 8} {incr i} {

$ns duplex-link $n($i) $n([expr $i+1]) 1Mb 10ms DropTail }
$ns duplex-link $n(0) $n(8) 1Mb 10ms DropTail
$ns duplex-link $n(1) $n(10) 1Mb 10ms DropTail
$ns duplex-link $n(0) $n(9) 1Mb 10ms DropTail
$ns duplex-link $n(9) $n(11) 1Mb 10ms DropTail
$ns duplex-link $n(10) $n(11) 1Mb 10ms DropTail
$ns duplex-link $n(11) $n(5) 1Mb 10ms DropTail

set udp0 [new Agent/UDP]
$ns attach-agent $n(0) $udp0

set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500

$cbr0 set interval_ 0.005
$cbr0 attach-agent $udp0

set null0 [new Agent/Null]
$ns attach-agent $n(5) $null0
$ns connect $udp0 $null0

set udp1 [new Agent/UDP]
$ns attach-agent $n(1) $udp1
set cbr1 [new Application/Traffic/CBR]

$cbr1 set packetSize_ 500
$cbr1 set interval_ 0.005
$cbr1 attach-agent $udp1

set null0 [new Agent/Null]
$ns attach-agent $n(5) $null0
$ns connect $udp1 $null0

$ns rtproto LS

$ns rtmodel-at 10.0 down $n(11) $n(5)
```

```
$ns rtmodel-at 15.0 down $n(7) $n(6)
$ns rtmodel-at 30.0 up $n(11) $n(5)
$ns rtmodel-at 20.0 up $n(7) $n(6)

$udp0 set fid_ 1
$udp1 set fid_ 2

$ns color 1 Red
$ns color 2 Green

$ns at 1.0 "$cbr0 start"
$ns at 2.0 "$cbr1 start"

$ns at 45 "finish"
$ns run
```