LAB1

a simple topology of four nodes, and two agents, a UDP agent with a CBR traffic generator, and a TCP
agent

```
set ns [new Simulator]
set f [open out.tr w]
$ns trace-all $f
set nf [open out.nam w]
$ns namtrace-all $nf

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

$ns duplex-link $n0 $n2 5Mb 2ms DropTail
$ns duplex-link $n1 $n2 5Mb 2ms DropTail
$ns duplex-link $n2 $n3 1.5Mb 10ms DropTail

set udp0 [new Agent/UDP]
$ns attach-agent $n0 $udp0
set cbr0 [new Application/Traffic/CBR]
$cbr0 attach-agent $udp0
$udp0 set class_ 0

set null0 [new Agent/Null]
$ns attach-agent $n3 $null0

$ns connect $udp0 $null0
$ns at 1.0 "$cbr0 start"

puts [$cbr0 set packetSize_]
puts [$cbr0 set interval_]


set tcp [new Agent/TCP]
$tcp set class_ 1
$ns attach-agent $n1 $tcp
set sink [new Agent/TCPSink]
$ns attach-agent $n3 $sink

set ftp [new Application/FTP]
$ftp attach-agent $tcp
$ns at 1.2 "$ftp start"
```

```
$ns connect $tcp $sink
$ns at 1.35 "$ns detach-agent $n0 $tcp ; $ns detach-agent $n3 $sink"

$ns at 3.0 "finish"
proc finish {} {
global ns f nf
$ns flush-trace
close $f
close $nf
puts "running nam..."
exec nam out.nam &
exit 0
}

$ns run
```

LAB2 Simulation of Ethernet Lan

```
set ns [new Simulator]
$ns color 1 Blue
$ns color 2 Red
set tracefile1 [open out.tr w]
set winfile [open winfile w]
$ns trace-all $tracefile1
set namfile [open out.nam w]
$ns namtrace-all $namfile
proc finish {} {
global ns tracefile1 namfile
$ns flush-trace
close $tracefile1
close $namfile
exec nam out.nam &
exit 0
}
set n0 [$ns node]
set n1 [$ns node]
set n2 [$ns node]
set n3 [$ns node]
set n4 [$ns node]
set n5 [$ns node]
$n1 color Red
```

```
$n1 shape box
$ns duplex-link $n0 $n2 2Mb 10ms DropTail
$ns duplex-link $n1 $n2 2Mb 10ms DropTail
$ns simplex-link $n2 $n3 0.3Mb 100ms DropTail
$ns simplex-link $n3 $n2 0.3Mb 100ms DropTail
set lan [$ns newLan "$n3 $n4 $n5" 0.5Mb 40ms LL Queue/DropTailMAC/Csma/Cd Channel]
$ns duplex-link-op $n0 $n2 orient right-down
$ns duplex-link-op $n1 $n2 orient right-up
$ns simplex-link-op $n2 $n3 orient right
$ns simplex-link-op $n3 $n2 orient left
$ns queue-limit $n2 $n3 20
set tcp [new Agent/TCP/Newreno]
$ns attach-agent $n0 $tcp
set sink [new Agent/TCPSink/DelAck]
$ns attach-agent $n4 $sink
$ns connect $tcp $sink
$tcp set fid_ 1
$tcp set packet_size_ 552

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

set udp [new Agent/UDP]
$ns attach-agent $n1 $udp
set null [new Agent/Null]
$ns attach-agent $n5 $null
$ns connect $udp $null
$udp set fid_ 2

set cbr [new Application/Traffic/CBR]
$cbr attach-agent $udp
$cbr set type_ CBR
$cbr set packet_size_ 1000
$cbr set rate_ 0.01Mb
$cbr set random_ false

$ns at 0.1 "$cbr start"
$ns at 1.0 "$ftp start"
$ns at 124.0 "$ftp stop"
$ns at 125.5 "$cbr stop"
proc plotWindow {tcpSource file} {
global ns
set time 0.1
set now [$ns now]
```

```
set cwnd [$tcpSource set cwnd_]
puts $file "$now $cwnd"
$ns at [expr $now+$time] "plotWindow $tcpSource $file"
}
$ns at 0.1 "plotWindow $tcp $winfile"
$ns at 125.0 "finish"
$ns run
```

LAB3

3.1) token ring

```
set ns [new Simulator]
set nf [open out.nam w]
$ns namtrace-all $nf
proc finish {} {
global ns nf
$ns flush-trace
close $nf
exec nam out.nam &
exit 0
}

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

$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
set tcp0 [new Agent/TCP]
$tcp0 set class_ 1
$ns attach-agent $n1 $tcp0
set sink0 [new Agent/TCPSink]
```

```
$ns attach-agent $n3 $sink0
$ns connect $tcp0 $sink0
set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.01
$cbr0 attach-agent $tcp0
$ns at 0.5 "$cbr0 start"
$ns at 4.5 "$cbr0 stop"
$ns at 5.0 "finish"
$ns run
```

3.2) Star topology

```
set ns [new Simulator]
set nf [open out.nam w]
$ns namtrace-all $nf
proc finish {} {
global ns nf
$ns flush-trace
close $nf
exec nam out.nam &
exit 0
}

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 shape square
$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
set tcp0 [new Agent/TCP]
$tcp0 set class_ 1
$ns attach-agent $n1 $tcp0
set sink0 [new Agent/TCPSink]
$ns attach-agent $n3 $sink0
```

```
$ns connect $tcp0 $sink0
set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set interval_ 0.01
$cbr0 attach-agent $tcp0
$ns at 0.5 "$cbr0 start"
$ns at 4.5 "$cbr0 stop"
$ns at 5.0 "finish"
$ns run
```