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#b. Implement transmission of ping messages/trace route over a
#network topology consisting of 6 nodes and find the number of packets
#dropped due to congestion

#Create Simulator
set ns [new Simulator]

#Use colors to differentiate the traffic
$ns color 1 Blue
$ns color 2 Red

#Open trace and NAM trace file
set ntrace [open 10b.tr w]
$ns trace-all $ntrace
set namfile [open 10b.nam w]
$ns namtrace-all $namfile

#Finish Procedure
proc Finish {} {
global ns ntrace namfile

#Dump all trace data and close the file
$ns flush-trace
close $ntrace
close $namfile

#Execute the nam animation file
exec nam 10b.nam &

#Find the number of ping packets dropped
puts "The number of ping packets dropped are "
exec grep "^d" 10b.tr | cut -d " " -f 5 | grep -c "ping" &
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exit 0
}

#Create six nodes
for {set i 0} {$i < 6} {incr i} {
set n($i) [$ns node]
}

#Connect the nodes
for {set j 0} {$j < 5} {incr j} {
$ns duplex-link $n($j) $n([expr ($j+1)]) 0.1Mb 10ms DropTail
}

#Define the recv function for the class 'Agent/Ping'
Agent/Ping instproc recv {from rtt} {
$self instvar node_
puts "node [$node_ id] received ping answer from $from with round trip time $rtt
ms"
}

#Create two ping agents and attach them to n(0) and n(5)
set p0 [new Agent/Ping]
$p0 set class_ 1
$ns attach-agent $n(0) $p0
set p1 [new Agent/Ping]
$p1 set class_ 1
$ns attach-agent $n(5) $p1
$ns connect $p0 $p1



#Set queue size and monitor the queue
#Queue size is set to 2 to observe the drop in ping packets
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$ns queue-limit $n(2) $n(3) 2
$ns duplex-link-op $n(2) $n(3) queuePos 0.5

#Create Congestion
#Generate a Huge CBR traffic between n(2) and n(4)
set tcp0 [new Agent/TCP]
$tcp0 set class_ 2
$ns attach-agent $n(2) $tcp0
set sink0 [new Agent/TCPSink]
$ns attach-agent $n(4) $sink0
$ns connect $tcp0 $sink0

#Apply CBR traffic over TCP
set cbr0 [new Application/Traffic/CBR]
$cbr0 set packetSize_ 500
$cbr0 set rate_ 1Mb
$cbr0 attach-agent $tcp0

#Schedule events
$ns at 0.2 "$p0 send"
$ns at 0.4 "$p1 send"
$ns at 0.4 "$cbr0 start"
$ns at 0.8 "$p0 send"
$ns at 1.0 "$p1 send"
$ns at 1.2 "$cbr0 stop"
$ns at 1.4 "$p0 send"
$ns at 1.6 "$p1 send"
$ns at 1.8 "Finish"

#Run the Simulation
$ns run
```

#output

#node 0 received ping answer from 5 with round trip time 151.2 ms

#node 0 received ping answer from 5 with round trip time 301.4 ms

#node 5 received ping answer from 0 with round trip time 155.4 ms

#The number of ping packets dropped are 3