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Exercise 9: TCP UDP Performance Evaluation

tcp-udp-performance.tcl

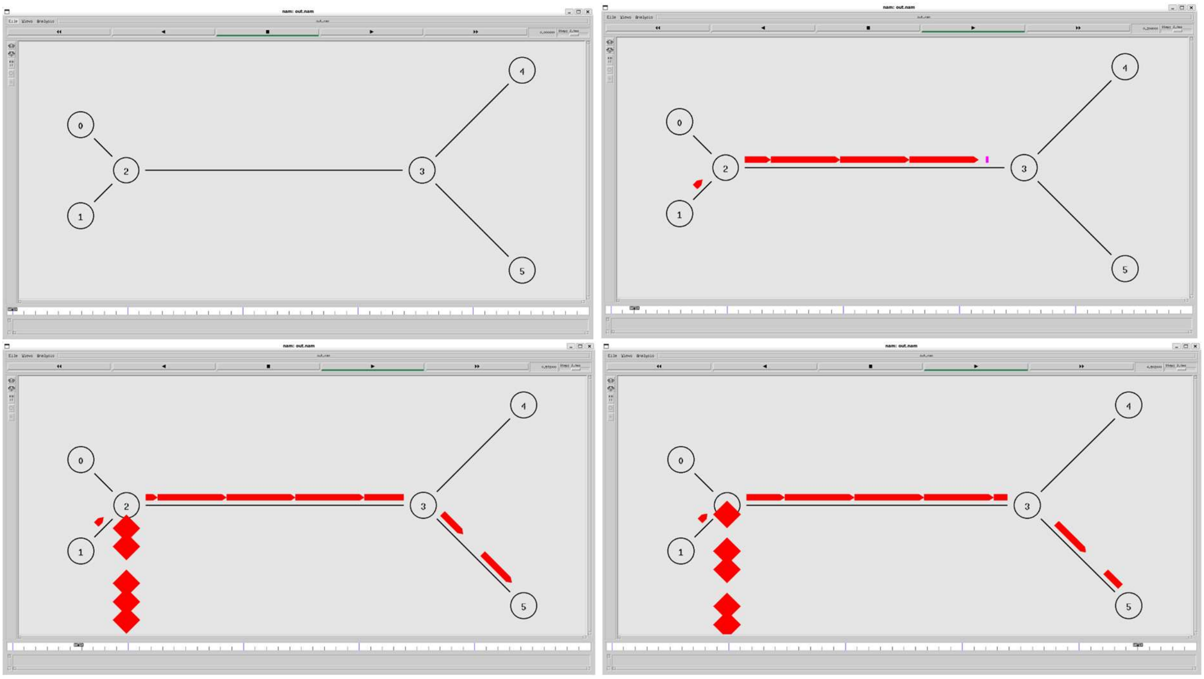
```
# Create a simulator object
set ns [new Simulator]

# Define different colors for data flows
$ns color 1 Magenta
$ns color 2 Red

# Open trace files
set tracefile [open out.tr w]
$ns trace-all $tracefile
set namfile [open out.nam w]
$ns namtrace-all $namfile

# Define a 'finish' procedure
proc finish {} {
    global ns tracefile namfile
    $ns flush-trace
    close $tracefile
    close $namfile
    exec nam out.nam &
    exit 0
}

# 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]

# Create links between nodes
$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
$ns duplex-link $n3 $n4 0.5Mb 40ms DropTail
$ns duplex-link $n3 $n5 0.5Mb 40ms DropTail

# Set node positions for NAM
$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 duplex-link-op $n3 $n4 orient right-up
$ns duplex-link-op $n3 $n5 orient right-down
```

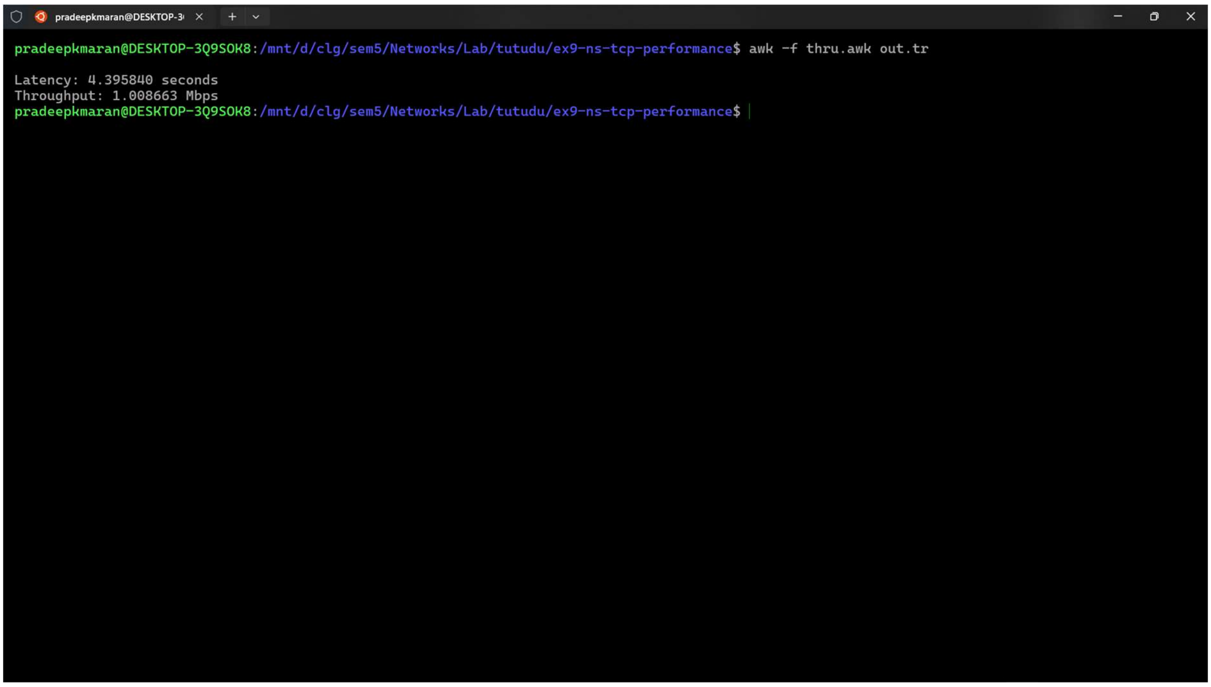
```
# Set queue size for bottleneck link
$ns queue-limit $n2 $n3 10

# Setup TCP connection
set tcp [new Agent/TCP]
$ns attach-agent $n0 $tcp
set sink [new Agent/TCPSink]
$ns attach-agent $n4 $sink
$ns connect $tcp $sink
$tcp set fid_ 1
$tcp set window_ 8000
$tcp set packetSize_ 1000

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

# Setup UDP Connection
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

# Setup UDP Application (CBR)
set cbr [new Application/Traffic/CBR]
$cbr attach-agent $udp
$cbr set type_ CBR
$cbr set packet_size_ 1000
$cbr set rate_ 1mb
$cbr set random_ false

# Schedule events
$ns at 0.1 "$cbr start"
$ns at 0.1 "$ftp start"
$ns at 4.5 "$ftp stop"
$ns at 4.5 "$cbr stop"
$ns at 5.0 "finish"

# Run the simulation
$ns run
```

thru.awk

```
BEGIN {
    stime = 0
    ftime = 0
    flag = 0
    fsize = 0
    throughput = 0
    latency = 0
} {
    if ($1 == "r" && $4 == 2) {              # Check for received packets with flow ID 4
        fsize += $6                          # Accumulate the size of received packets
        if (flag == 0) {                     # Set the start time on the first packet received
            stime = $2
            flag = 1
        }
        ftime = $2                           # Update the finish time to the latest packet received
    }
} END {
    latency = ftime - stime
    if (latency > 0) {
        throughput = (fsize * 8) / latency
        printf("\nLatency: %f seconds", latency)
        printf("\nThroughput: %f Mbps\n", throughput / 1000000)
    } else {
        printf("\nError: Invalid latency. Check start and finish times.\n")
    }
}
```

Output





```
pradeepkmaran@DESKTOP-3Q9SOK8:/mnt/d/clg/sem5/Networks/Lab/tutudu/ex9-ns-tcp-performance$ awk -f thru.awk out.tr

Latency: 4.395840 seconds
Throughput: 1.008663 Mbps
pradeepkmaran@DESKTOP-3Q9SOK8:/mnt/d/clg/sem5/Networks/Lab/tutudu/ex9-ns-tcp-performance$
```