# Ex 9 :Network Topology

**Token Bus:**

```
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
}

for {set i 0} {$i < 5} {incr i} {
    set n($i) [$ns node];
}

set lan [$ns newLan "$n(0) $n(1) $n(2) $n(3) $n(4)" 0.5Mb 40ms LL Queue/DropTail
MAC/Csma/Cd Channel]

set tcp [new Agent/TCP]
$tcp set class_ 1
$ns attach-agent $n(1) $tcp

set sink [new Agent/TCPSink]
$ns attach-agent $n(3) $sink

$ns connect $tcp $sink

set cbr [new Application/Traffic/CBR]
$cbr set packetSize_ 500
$cbr set interval_ 0.01
$cbr attach-agent $tcp

$ns at 0.5 "$cbr start"
$ns at 4.5 "$cbr stop"

$ns at 5.0 "finish"

$ns run
```

**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
}

for {set i 0} {$i < 6} {incr i} {
    set n($i) [$ns node];
}

for {set i 0} {$i < 6} {incr i} {
    $ns duplex-link $n($i) $n([expr ($i+1) % 6]) 1Mb 10ms DropTail
}

set tcp [new Agent/TCP]
#$tcp set class_ 1
$ns attach-agent $n(1) $tcp

set sink [new Agent/TCPSink]
$ns attach-agent $n(3) $sink

$ns connect $tcp $sink

set cbr [new Application/Traffic/CBR]
#$cbr set packetSize_ 500
#$cbr set interval_ 0.01
$cbr attach-agent $tcp

$ns at 0.5 "$cbr start"
$ns at 4.5 "$cbr stop"

$ns at 5.0 "finish"

$ns run
```

**Token Star :**

```
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
}

for {set i 0} {$i < 6} {incr i} {
    set n($i) [$ns node];
}

$n(0) shape square

for {set i 1} {$i < 6} {incr i} {
    $ns duplex-link $n(0) $n($i) 1Mb 10ms DropTail
}

set tcp [new Agent/TCP]
$tcp set class_ 1
$ns attach-agent $n(1) $tcp

set sink [new Agent/TCPSink]
$ns attach-agent $n(3) $sink

$ns connect $tcp $sink

set cbr [new Application/Traffic/CBR]
$cbr set packetSize_ 500
$cbr set interval_ 0.01
$cbr attach-agent $tcp

$ns at 0.5 "$cbr start"
$ns at 4.5 "$cbr stop"

$ns at 5.0 "finish"

$ns run
```

# Ex 10(a) : Simulation of Go Back N Protocol

```
set ns [new Simulator]

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

proc finish {} {
    global ns nf
    $ns flush-trace
    close $nf

    puts "filtering..."
    #exec tclsh../bin/namfilter.tclgoback.nam #puts "running nam..."
    exec nam goback.nam &
    exit 0
}

set colors  {"purple" "violet" "chocolate"}
for {set i 0} {$i < 6} {incr i} {
    set n($i) [$ns node];
    #$n($i) color
    $n($i) shape box
    $ns at 0.0 "$n($i) label SYS$i"

}

$ns duplex-link $n(0) $n(2) 1Mb 20ms DropTail
$ns duplex-link-op $n(0) $n(2) orient right-down
$ns queue-limit $n(0) $n(2) 5
$ns duplex-link $n(1) $n(2) 1Mb 20ms DropTail
$ns duplex-link-op $n(1) $n(2) orient right-up

$ns duplex-link $n(2) $n(3) 1Mb 20ms DropTail
$ns duplex-link-op $n(2) $n(3) orient right

$ns duplex-link $n(3) $n(4) 1Mb 20ms DropTail
$ns duplex-link-op $n(3) $n(4) orient right-up
$ns duplex-link $n(3) $n(5) 1Mb 20ms DropTail
$ns duplex-link-op $n(3) $n(5) orient right-down

Agent/TCP set_nam_tracevar_true
set tcp [new Agent/TCP]
$tcp set fid 1
$ns attach-agent $n(1) $tcp
set sink [new Agent/TCPSink]
$ns attach-agent $n(4) $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 windowlnit 6"
$ns at 0.06 "$tcp set maxcwnd 6"
$ns at 0.25 "$ns queue-limit $n(3) $n(4) 0"
$ns at 0.26 "$ns queue-limit $n(3) $n(4) 10"
$ns at 0.305 "$tcp set windowlnit 4"
$ns at 0.305 "$tcp set maxcwnd 4"
$ns at 0.368 "$ns detach-agent $n(1) $tcp ; $ns detach-agent $n(4) $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\""

$ns run
```

# Ex 10(b) : Simulation of Selective Repeat Protocol

```
set ns [new Simulator]

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

proc finish {} {
    global ns nf
    $ns flush-trace
    close $nf

    puts "filtering..."
    #exec tclsh../bin/namfilter.tclgoback.nam #puts "running nam..."
    exec nam goback.nam &
    exit 0
}

set colors  {"purple" "violet" "chocolate"}
for {set i 0} {$i < 6} {incr i} {
    set n($i) [$ns node];
    #$n($i) color
    $n($i) shape circle
    $ns at 0.0 "$n($i) label SYS$i"

}

$ns duplex-link $n(0) $n(2) 1Mb 20ms DropTail
$ns duplex-link-op $n(0) $n(2) orient right-down
$ns queue-limit $n(0) $n(2) 5
$ns duplex-link $n(1) $n(2) 1Mb 20ms DropTail
$ns duplex-link-op $n(1) $n(2) orient right-up
$ns duplex-link $n(2) $n(3) 1Mb 20ms DropTail
$ns duplex-link-op $n(2) $n(3) orient right
$ns duplex-link $n(3) $n(4) 1Mb 20ms DropTail
$ns duplex-link-op $n(3) $n(4) orient right-up
$ns duplex-link $n(3) $n(5) 1Mb 20ms DropTail
$ns duplex-link-op $n(3) $n(5) orient right-down

Agent/TCP set_nam_tracevar_true
set tcp [new Agent/TCP]
$tcp set fid 1
$ns attach-agent $n(1) $tcp
set sink [new Agent/TCPSink]
$ns attach-agent $n(4) $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 windowlnit 8"
$ns at 0.06 "$tcp set maxcwnd 8"
$ns at 0.25 "$ns queue-limit $n(3) $n(4) 0"
$ns at 0.26 "$ns queue-limit $n(3) $n(4) 10"
$ns at 0.30 "$tcp set windowlnit 1"
$ns at 0.30 "$tcp set maxcwnd 1"
$ns at 0.30 "$ns queue-limit $n(3) $n(4) 10"
$ns at 0.47 "$ns detach-agent $n(1) $tcp;$ns detach-agent $n(4) $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\""

$ns run
```

# EX 11:Simulation of TCP/IP Data Transfer

```
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
}

for {set i 0} {$i < 4} {incr i} {
    set n($i) [$ns node];
}

for {set i 0} {$i < 4} {incr i} {
    $ns duplex-link $n($i) $n([expr ($i+1)%3 ]) 10Mb 10ms DropTail
}

$ns duplex-link-op $n(0) $n(1) orient right-down
$ns duplex-link-op $n(1) $n(3) orient right
$ns duplex-link-op $n(2) $n(1) orient right-up

set tcp [new Agent/TCP]
$ns attach-agent $n(0) $tcp

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

set sink [new Agent/TCPSink]
$ns attach-agent $n(3) $sink

set udp [new Agent/UDP]
$ns attach-agent $n(2) $udp

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

set null [new Agent/Null]
$ns attach-agent $n(3) $null

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

$ns rtmodel-at 1.0 down $n(1) $n(3)
$ns rtmodel-at 2.0 up $n(1) $n(3)
$ns rtproto DV

$ns at 0.0 "$ftp start"
$ns at 0.0 "$cbr start"
$ns at 5.0 "finish"

$ns run
```

# EX12 (a) Simulationof Distance Vector Routing Algorithm

```
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
}

for {set i 0} {$i < 4} {incr i} {
    set n($i) [$ns node];
}

for {set i 0} {$i < 4} {incr i} {
    $ns duplex-link $n($i) $n([expr ($i+1)%3 ]) 10Mb 10ms DropTail
}

$ns duplex-link-op $n(0) $n(1) orient right-down
$ns duplex-link-op $n(1) $n(3) orient right
$ns duplex-link-op $n(2) $n(1) orient right-up

set tcp [new Agent/TCP]
$ns attach-agent $n(0) $tcp

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

set sink [new Agent/TCPSink]
$ns attach-agent $n(3) $sink

set udp [new Agent/UDP]
$ns attach-agent $n(2) $udp

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

set null [new Agent/Null]
$ns attach-agent $n(3) $null

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

$ns rtmodel-at 1.0 down $n(1) $n(3)
$ns rtmodel-at 2.0 up $n(1) $n(3)
$ns rtproto DV

$ns at 0.0 "$ftp start"
$ns at 0.0 "$cbr start"
$ns at 5.0 "finish"

$ns run
```

# Ex12(b) Simulation of Link State Routing Algorithm

```
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
```

# Ex 13 :Simulate a MobileAdhoc Network

```
set val(chan) Channel/WirelessChannel
set val(prop) Propagation/TwoRayGround
set val(netif) Phy/WirelessPhy
set val(mac) Mac/802_11
set val(ifq) Queue/DropTail/PriQueue
set val(ll) LL
set val(ant) Antenna/OmniAntenna
set val(ifqlen) 50
set val(nn) 3
set val(rp) DSDV

set ns [new Simulator]
set tf [open output.tr w]
$ns trace-all $tf
set tf1 [open output.nam w]
$ns namtrace-all-wireless $tf1 100 100

set topo [new Topography]
$topo load_flatgrid 100 100

create-god $val(nn)
$ns node-config -adhocRouting $val(rp) \
-llType $val(ll) \
-macType $val(mac) \
-ifqType $val(ifq) \
-ifqLen $val(ifqlen) \
-antType $val(ant) \
-propType $val(prop) \
-phyType $val(netif) \
-channelType $val(chan) \
-topoInstance $topo \
-agentTrace ON \
-routerTrace OFF \
-macTrace OFF \
-movementTrace OFF

for {set i 0} {$i < 3} {incr i} {
    set node($i) [$ns node];
    $ns initial_node_pos $node($i) 10
    $node($i) set Y_ 50.0
    $node($i) set Z_ 0.0
}

$node(0) set X_ 25.0
$node(1) set X_ 50.0
$node(2) set X_ 65.0


set tcp1 [new Agent/TCP]
$ns attach-agent $node(0) $tcp1
set ftp [new Application/FTP]
$ftp attach-agent $tcp1
set sink1 [new Agent/TCPSink]
$ns attach-agent $node(2) $sink1
$ns connect $tcp1 $sink1
$ns at 10.0 "$node(1) setdest 50.0 90.0 0.0"
$ns at 50.0 "$node(1) setdest 50.0 10.0 0.0"
$ns at 0.5 "$ftp start"
$ns at 1000 "$ftp stop"
```

```
$ns at 1000 "finish"

proc finish {} {
    global ns tf tf1
    $ns flush-trace
    close $tf
    exec nam output.nam &
    exit 0
}

$ns run
```

## Ex 14. : Implement TransportControl Protocolin

## Sensor Network

```
set ns [new Simulator]

#Open the Trace files
set file1 [open out.tr w]
set winfile [open WinFile w]
$ns trace-all $file1
#Open the NAM trace file
set file2 [open out.nam w]
$ns namtrace-all $file2

#Define a 'finish' procedure
proc finish {} {
    global ns file1 file2
    $ns flush-trace
    close $file1
    close $file2
    exec nam out.nam &
    exit 0
}

#Define different colors for data flows (for NAM)
$ns color 1 Blue
$ns color 2 Red

#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]

$n1 color red
$n1 shape box
#Create links between the 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 $n2 0.3Mb 100ms DropTail
set lan [$ns newLan "$n3 $n4 $n5" 0.5Mb 40ms LL Queue/DropTail MAC/Csma/Cd Channel]

#Setup a TCP connection
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 window_ 8000
$tcp set packetSize_ 552

#Setup a FTP over TCP connection
set ftp [new Application/FTP]
$ftp attach-agent $tcp
$ftp set type_ FTP
$ns at 1.0 "$ftp start"
$ns at 124.0 "$ftp stop"
# next procedure gets two arguments: the name of the
# tcp source node, will be called here "tcp",
```

```
# and the name of output file.

proc plotWindow {tcpSource file} {
    global ns
    set time 0.1
    set now [$ns now]
    set cwnd [$tcpSource set cwnd_]
    set wnd [$tcpSource set window_]
    puts $file "$now $cwnd"
    $ns at [expr $now+$time] "plotWindow $tcpSource $file"
}

$ns at 0.1 "plotWindow $tcp $winfile"
$ns at 5 "$ns trace-annotate \"packet drop\""

# PPP
$ns at 125.0 "finish"
$ns run
```