



# Computer Network Lab(CSN-361)

Assignment - 4

5.09.2019

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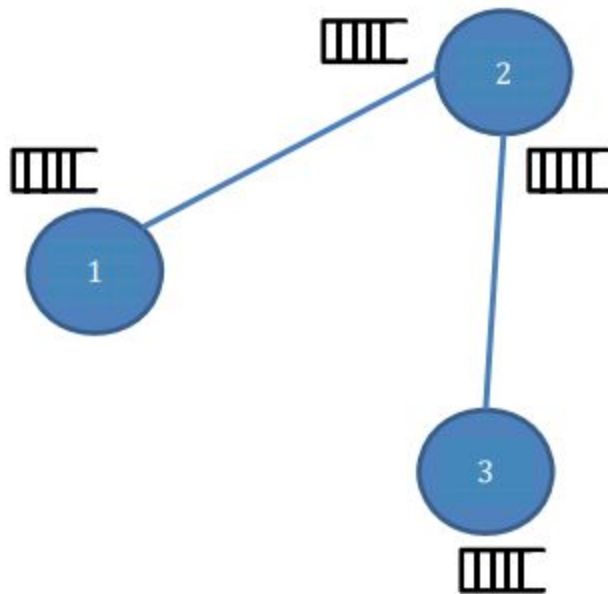
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Computer Science & Engineering

3rd yr

## Problem Statement 1:

Write a Network Simulator (NS2) code to simulate a three node network with duplex links among them as shown in figure. Show the topology using NAM. Study the variation in number of packets dropped with the variation of the queue size in the nodes and with the variation of the bandwidth of the links.



## Code

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



```
#Routing Protocol used is Distance Vector
```

```
$ns rtproto DV
```

```
set nf [open q1.nam w]
```

```
set f [open q1.tr w]
```

```
$ns namtrace-all $nf
```

```
$ns trace-all $f
```

```
proc end {} {
```

```
    global ns nf f
```

```
    $ns flush-trace
```

```
    close $nf
```

```
    close $f
```

```
    exec nam q1.nam
```

```
    exit 0
```

```
}
```

```
# Create the network nodes
```

```
set node1 [$ns node]
```

```
set node2 [$ns node]
```

```
set node3 [$ns node]
```

```
$node1 color blue
```

```
$node2 color orange
```

```
$node3 color green
```

```
#Create links between the nodes
```

```
$ns duplex-link $node1 $node2 1Mb 10ms DropTail
```



```
$ns duplex-link $node2 $node3 700kb 10ms DropTail
```

```
$ns queue-limit $node1 $node2 5
```

```
$ns queue-limit $node2 $node3 5
```

```
#Building link node1 and node3
```

```
set udp_con_0 [new Agent/UDP]
```

```
$udp_con_0 set class_ 1
```

```
$ns attach-agent $node1 $udp_con_0
```

```
set sink_node_0 [new Agent/Null]
```

```
$ns attach-agent $node3 $sink_node_0
```

```
$ns connect $udp_con_0 $sink_node_0
```

```
$ns color 1 Red
```

```
$udp_con_0 set fid_ 1
```

```
set cbr_con_0 [new Application/Traffic/CBR]
```

```
$cbr_con_0 set packetSize_ 1500
```

```
$cbr_con_0 set interval_ 0.015
```

```
$cbr_con_0 attach-agent $udp_con_0
```

```
$ns at 0.2 "$cbr_con_0 start"
```

```
$ns at 1.8 "$cbr_con_0 stop"
```

```
$ns at 2.0 "end"
```

```
$ns run
```

## PacketDrop Count

```
BEGIN{ c=0;}
{
  if($1=="d")
  { c++;
printf("%s\t%s\n",$5,$11);
  }
}
END{ printf("The number of packets dropped =%d\n",c); }
```

## Algorithm and Data Structures

### Tcl scripting

- Tcl is a general purpose scripting language. [Interpreter]
- Tcl runs on most of the platforms such as Unix, Windows, and Mac.
- The strength of Tcl is its simplicity.
- It is not necessary to declare a data type for variable prior to the usage.

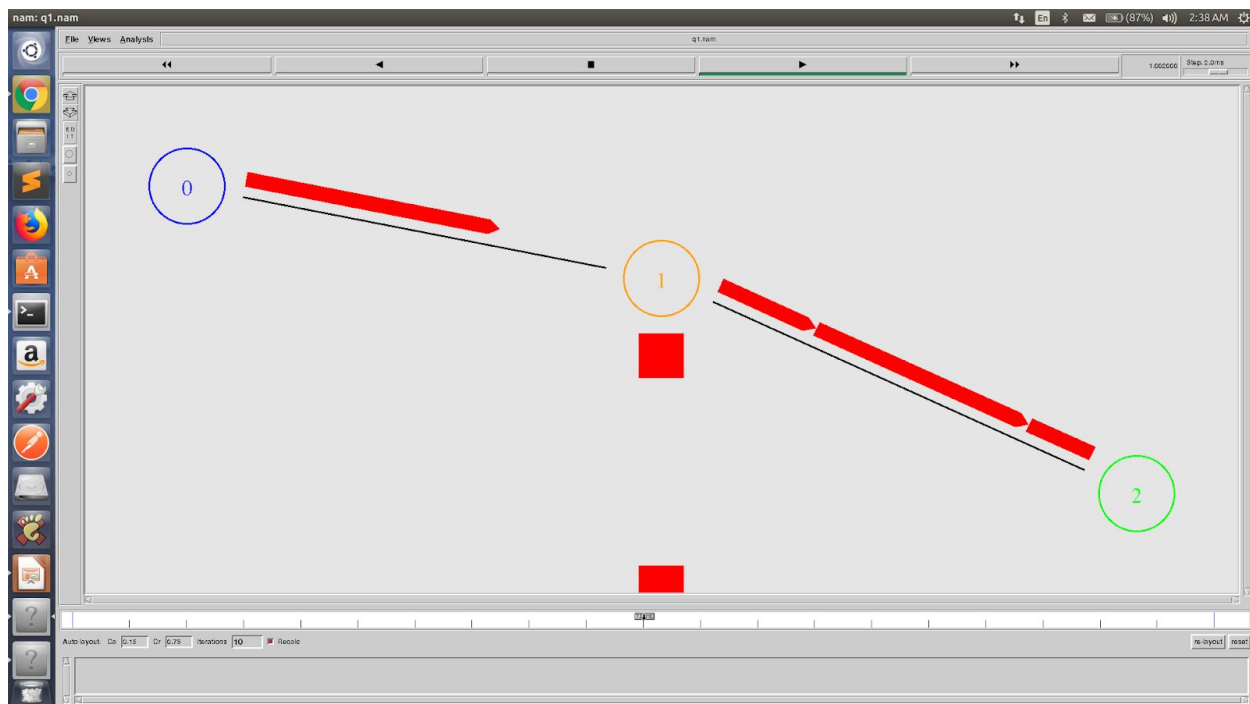
**Duplex-links** : to connect 2 nodes

**DropTail** : It is a simple queue mechanism that is used by the routers that when packets should to be drop.

**Queue-limit** : limits size of queue

Three nodes are connected and packets are transferred after a particular interval of time. Also, we have fixed queue size at each node.

## Screenshot of running code



```
shivanshbindal@shivanshubuntu:~/Course/ComputerNetwork/assign_4$ awk -f PacketDrop1.awk q1.tr
cbr      39
cbr      45
cbr      51
cbr      57
cbr      63
cbr      69
cbr      75
cbr      81
cbr      87
cbr      93
cbr      97
cbr     103
cbr     109
cbr     113
cbr     119
cbr     124
cbr     129
cbr     135
cbr     141
cbr     147
cbr     153
cbr     159
cbr     165
cbr     171
cbr     177
cbr     183
cbr     188
cbr     193
cbr     199
cbr     205
cbr     211
The number of packets dropped =31
shivanshbindal@shivanshubuntu:~/Course/ComputerNetwork/assign_4$
```

```
if($1=="d")
{
  c++;
  printf("%s\t%s\n",$5,$11);
}
END{ printf("The number of packets dropped =%d\n",c); }
```

### Algorithm and Data Structures

#### Tcl scripting

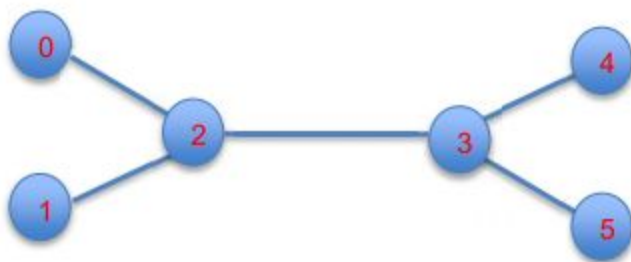
- Tcl is a general purpose scripting language. [Interpreter]
- Tcl runs on most of the platforms such as Unix, Windows, and Mac.
- The strength of Tcl is its simplicity.
- It is not necessary to declare a data type for variable prior to the use.

#### Duplex-links : to connect 2 nodes

#### DropTail : It is a simple queue mechanism that is used by the router. Its size of queue should to be drop.

## Problem Statement 2:

Write a Network Simulator (NS2) code to simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion. Study the variation in number of packets dropped with the variation of the queue size in the nodes and with the variation of the bandwidth of the links. Nodes are connected as follows: 0-2, 1-2, 2-3, 3-4 and 3-5 Packet transmissions: 0-4 and 5-1



## Code

```
set ns [new Simulator]

#Routing Protocol used is Distance Vector
$ns rtproto DV

set nf [open q2.nam w]
set f [open q2.tr w]

$ns namtrace-all $nf
```



```
$ns trace-all $f
```

```
proc end {} {  
    global ns nf f  
    $ns flush-trace  
    close $nf  
    close $f  
    exec nam q2.nam  
    exit 0  
}
```

```
# Create the network nodes
```


```
set node0 [$ns node]  
set node1 [$ns node]  
set node2 [$ns node]  
set node3 [$ns node]  
set node4 [$ns node]  
set node5 [$ns node]
```

```
$node0 color blue  
$node1 color green  
$node2 color yellow  
$node3 color orange  
$node4 color pink
```

```
#Create links between the nodes
```

```
$ns duplex-link $node0 $node2 10Mb 10ms DropTail  
$ns duplex-link $node1 $node2 1000kb 10ms DropTail
```





```
$ns duplex-link $node2 $node3 1Mb 10ms DropTail
$ns duplex-link $node3 $node4 1000Mb 10ms DropTail
$ns duplex-link $node3 $node5 500Mb 10ms DropTail
```

```
$ns queue-limit $node0 $node2 5
$ns queue-limit $node2 $node1 5
$ns queue-limit $node2 $node3 5
$ns queue-limit $node3 $node2 5
$ns queue-limit $node3 $node4 5
$ns queue-limit $node5 $node3 5
```

```
set p1 [new Agent/Ping]
$ns attach-agent $node0 $p1
$p1 set packetSize_ 50000
$p1 set interval_ 0.0001
```

```
$ns color 1 Red
$p1 set fid_ 1
```

```
set p2 [new Agent/Ping]
$ns attach-agent $node4 $p2
```

```
$p2 set fid_ 1
```

```
set p3 [new Agent/Ping]
$ns attach-agent $node5 $p3
$p3 set packetSize_ 30000
$p3 set interval_ 0.00001
```

```
$ns color 2 Green
```

```
$p3 set fid_ 2
```

```
set p4 [new Agent/Ping]
```

```
$ns attach-agent $node1 $p4
```

```
$p4 set fid_ 2
```

```
Agent/Ping instproc recv {from rtt} {
```

```
  $self instvar node_
```

```
  puts "node [$node_ id] received answer from $from with round trip time  
  $rtt msec"
```

```
}
```

```
$ns connect $p1 $p2
```

```
$ns connect $p3 $p4
```

```
for {set i 1} {$i < 30} {incr i} {
```

```
  $ns at [expr ($i) * 0.1] "$p1 send"
```

```
}
```

```
for {set i 1} {$i < 30} {incr i} {
```

```
  $ns at [expr ($i) * 0.1] "$p3 send"
```

```
}
```

```
$ns at 3.0 "end"
```

```
$ns run
```

## PacketDrop Count

```
BEGIN{
drop=0;
}
{
if($1=="d" )
{
drop++;
}
}
END{
printf("Total number of packets dropped due to congestion =
%d\n",drop);
}
```

## Algorithm and Data Structures

### Tcl scripting

- Tcl is a general purpose scripting language. [Interpreter]
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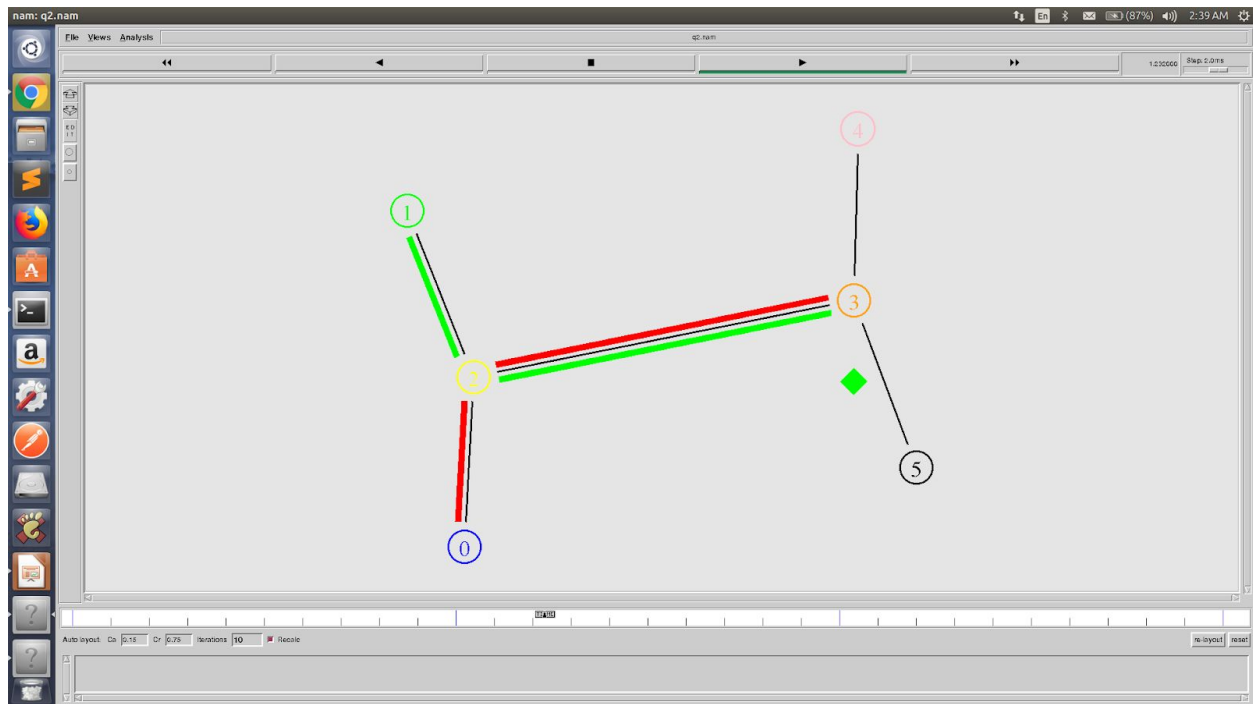
**Duplex-links** : to connect 2 nodes

**DropTail** : It is a simple queue mechanism that is used by the routers that when packets should to be drop.

**Queue-limit** : limits size of queue

Six nodes are connected and packets are transferred after a particular interval of time. Also, we have fixed queue size at each node.

## Screenshot of running code



```
shivanshbindal@shivanshubuntu:~/Course/ComputerNetwork/assign_4$ ns3 Question2.tcl
node 0 received answer from 4 with round trip time 1231.0 msec
node 5 received answer from 1 with round trip time 2070.5 msec
node 0 received answer from 4 with round trip time 1991.6 msec
shivanshbindal@shivanshubuntu:~/Course/ComputerNetwork/assign_4$
```

```
shivanshbindal@shivanshubuntu:~/Course/ComputerNetwork/assign_4$ awk -f PacketDrop.awk q2.tr
Total number of packets dropped due to congestion = 47
shivanshbindal@shivanshubuntu:~/Course/ComputerNetwork/assign_4$
```

Nodes are connected as follows: