

# Computer Network Lab

## Exp 03: TCP Congestion Window

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# Ex07 Resources

- References:
  - Local area networks
    - <https://www.isi.edu/nsnam/ns/doc/node143.html>
  - Transport layer : UDP and TCP agents
    - <https://www.isi.edu/nsnam/ns/doc/node383.html>
    - <https://www.isi.edu/nsnam/ns/doc/node387.html>
  - TCP Tahoe(Default) and Reno
  - TCP traffic flow
    - [http://www.netlab.tkk.fi/opetus/s38148/s02/sim\\_harj/ns2\\_exers.pdf](http://www.netlab.tkk.fi/opetus/s38148/s02/sim_harj/ns2_exers.pdf)
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# Exp 03 Description

- Program 03(NS2)
  - Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.

# Lab Program Snippets

- Make a LAN : syntax
  - ns make-lan nodelist bw delay LL ifq MAC channel phy

- Tcl code example

```
$ns make-lan "$n0 $n1 $n2 $n3 $n4" 10Mb  
10ms LL Queue/DropTail Mac/802_3  
$ns make-lan "$n0 $n1 $n2 $n3 $n4" 10Mb  
10ms LL Queue/DropTail Mac/Csma/Cd
```

- Create TCP Source and Sink

- TCP agent : Tahoe (default), Reno, NewReno, ...

- Tcl code example

```
set tcp0 [new Agent/TCP]  
$ns attach-agent $n0 $tcp0  
set tcp1 [new Agent/TCP/Reno]  
$ns attach-agent $n1 $tcp1
```

# Lab Program Snippets

- **TCP Sink agents**

```
set sink0 [new Agent/TCPSink]  
set sink1 [new Agent/TCPSink]  
$ns attach-agent $n2 $sink0  
$ns attach-agent $n3 $sink1
```

- **TCP parameters**

```
– Agent/TCP set packetSize_ 960
```

# Lab Program Snippets

- **TCP Application agents e.g. FTP**

```
set ftp0 [new Application/FTP]
set ftp1 [new Application/FTP]
$ftp0 attach-agent $tcp0
$ftp1 attach-agent $tcp1
```

- **Connect TCP applications end points**

```
$ns connect $tcp0 $sink0
$ns connect $tcp1 $sink1
```

- **TCP parameters**

```
– Agent/TCP set packetSize_ 960
```

# Lab Program Snippets

- **TCP traffic statistics recording**

```
set file1 [open conn1.tr w]
set file2 [open conn2.tr w]
$tcp0 attach $file1
$tcp1 attach $file2
$tcp0 trace cwnd_
$tcp1 trace cwnd_
```

# Lab Program Snippets

- **Finish procedure**

```
proc finish { } {  
    global ns nf tf file1 file2  
    $ns flush-trace  
    close $tf  
    close $nf  
    close $file1  
    close $file2  
    exec nam lab3.nam &  
    exit 0  
}
```



# Lab Program Snippets

- **Actual traffic generation**

```
$ns at 1.0 "$ftp0 start"  
$ns at 5.0 "$ftp0 stop"  
$ns at 5.0 "$ftp1 start"  
$ns at 9.0 "$ftp1 stop"  
$ns at 10.5 "$ftp0 start"  
$ns at 11.0 "$ftp1 start"  
$ns at 19.0 "$ftp0 stop"  
$ns at 20.0 "$ftp1 stop"  
  
$ns at 21 "finish"  
$ns run
```

# Generating Congestion Window

- awk script to process cwnd, sample tr

```
0.00000 0 0 5 0 cwnd_ 1.000
0.10767 0 0 5 0 cwnd_ 2.000
0.13126 0 0 5 0 cwnd_ 3.000
```

- program lab03.awk

```
BEGIN { }
{
    if ($6=="cwnd_")
        printf ("%f\t%f\t\n", $1, $7) ;
}
END { }
```

- Processing of trace file

# Analyzing Cwnd

- Processing cwnd trace file

```
awk -f lab3.awk file1.tr >c1
```

```
awk -f lab3.awk file2.tr >c2
```

- Viewing graph

```
xgraph c1 c2
```

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# Lab exercise

- Lab 3a:
  - Generate TCP traffic with single source and single sink, Analyze TCP congestion window
- Lab 3b:
  - Generate non-overlapping TCP traffic with two sources and two sinks, Analyze TCP cwnd
- Lab 3c
  - Generate overlapping traffic of multiple TCP Source
- Lab 3d
  - Generate some CBR traffic to cause some packet loss and see cwnd behaviour
- Lab 3d
  - Generate two LANs, connected via a link.
  - Generate traffic across

# Summary

- Generate TCP Traffic
- Identify congestion window
- Generate traffic from single and multiple source.

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