**Program 5 (GSM)**

```
#set Parameters
set stop 100     ;# Stop time.

# Topology
set type gsm    ;#type of link:

# AQM parameters
set minth 30
set maxth 0
set adaptive 1  ;# 1 for Adaptive RED, 0 for plain RED

# Traffic generation.
set flows 0      ;# number of long-lived TCP flows
set window 30 ;# window for long-lived traffic

# Plotting statistics.
set opt(wrap) 100 ; # wrap plots?
set opt(srcTrace) is ;# where to plot traffic
set opt(dstTrace) bs2 ;# where to plot traffic


#default downlink bandwidth in bps
set bwDL(gsm)  9600

#default downlink propagation delay in seconds
set propDL(gsm)  .500

set ns [new Simulator]

set tf [open Mlab5.tr w]
$ns trace-all $tf

set nodes(is) [$ns node]
set nodes(ms) [$ns node]
set nodes(bs1) [$ns node]
set nodes(bs2) [$ns node]
set nodes(lp) [$ns node]


proc cell_topo {} {
global ns nodes
$ns duplex-link $nodes(lp) $nodes(bs1) 3Mbps 10ms DropTail
```

```
$ns duplex-link $nodes(bs1) $nodes(ms) 1 1 RED
$ns duplex-link $nodes(ms) $nodes(bs2) 1 1 RED
$ns duplex-link $nodes(bs2) $nodes(is) 3Mbps 50ms DropTail
puts "GSM Cell Topology"
}

proc set_link_params {t} {

global ns nodes bwDL propDL
$ns bandwidth $nodes(bs1) $nodes(ms) $bwDL($t) duplex
$ns bandwidth $nodes(bs2) $nodes(ms) $bwDL($t) duplex

$ns delay $nodes(bs1) $nodes(ms) $propDL($t) duplex
$ns delay $nodes(bs2) $nodes(ms) $propDL($t) duplex

$ns queue-limit $nodes(bs1) $nodes(ms) 10
$ns queue-limit $nodes(bs2) $nodes(ms) 10
}

# RED and TCP parameter
Queue/RED set adaptive_ $adaptive
Queue/RED set thresh_ $minth
Queue/RED set maxthresh_ $maxth
Agent/TCP set window_ $window

#Create topology
switch $type {
gsm {cell_topo}
}

set_link_params $type
$ns insert-delayer $nodes(ms) $nodes(bs1) [new Delayer]
$ns insert-delayer $nodes(ms) $nodes(bs2) [new Delayer]

# Set up forward TCP connection
if {$flows == 0} {
set tcp1 [$ns create-connection TCP/Sack1 $nodes(is) TCPSink/Sack1 nodes(lp) 0]
set ftp1 [[set tcp1] attach-app FTP]
$ns at 0.8 "[set ftp1] start"
}

proc  stop {} {
global nodes opt tf
set wrap $opt(wrap)
```

```
set sid [$nodes($opt(srcTrace)) id]
set did [$nodes($opt(dstTrace)) id]

set a "Mlab5.tr"

set GETRC "/var/cn/ns-allinone-2.35/ns-2.35/bin/getrc"
set RAW2XG "/var/cn/ns-allinone-2.35/ns-2.35/bin/raw2xg"

exec $GETRC -s $sid -d $did -f 0 Mlab5.tr | \
$RAW2XG -s 0.01 -m $wrap -r > plot.xgr

exec $GETRC -s $did -d $sid -f 0 Mlab5.tr | \
$RAW2XG -a -s 0.01 -m $wrap >> plot.xgr

exec xgraph -x time -y packets plot.xgr &
exit 0
}
$ns at $stop "stop"
$ns run
```