

### Laboratorium 4: Queue utilization, packets that are delivered twice

1. Zadania do wykonania:
  - a. Uruchomienie skryptu NS dla kolejki o rozmiarze 7 i 40 dla długości symulacji 1000s.
  - b. Przygotowanie skryptu w Pythonie do obliczenia użycia kolejki i ilość pakietów poddanych retransmisji.
2. Uruchomiono następujący skrypt w NS.

```
1  # basic1.tcl simulation: A---R---B
2
3  #Create a simulator object
4  set queuesize $argv
5  set ns [new Simulator]
6
7  #Open the nam file basic1.nam and the variable-trace file basic1.tr
8  set namfile [open basic1.nam w]
9  $ns namtrace-all $namfile
10 set tracefile [open basic1.tr w]
11 $ns trace-all $tracefile
12
13 #Define a 'finish' procedure
14 proc finish {} {
15     global ns namfile tracefile
16     $ns flush-trace
17     close $namfile
18     close $tracefile
19     exit 0
20 }
21
22 #Create the network nodes
23 set A [$ns node]
24 set R [$ns node]
25 set B [$ns node]
26
27 #Create a duplex link between the nodes
28
29 $ns duplex-link $A $R 10Mb 50ms DropTail
30 $ns duplex-link $R $B 800Kb 100ms DropTail
31
32 # The queue size at $R is to be 7, including the packet being sent
33 $ns queue-limit $R $B $queuesize
34
35 # some hints for nam
36 # color packets of flow 0 red
37 $ns color 0 Red
38 $ns duplex-link-op $A $R orient right
39 $ns duplex-link-op $R $B orient right
40 $ns duplex-link-op $R $B queuePos 0.5
```

```

41
42 # Create a TCP sending agent and attach it to A
43 set tcp0 [new Agent/TCP/Reno]
44 # We make our one-and-only flow be flow 0
45 $tcp0 set class_ 0
46 $tcp0 set window_ 100
47 $tcp0 set packetSize_ 960
48 $ns attach-agent $A $tcp0
49
50 # Let's trace some variables
51 $tcp0 attach $tracefile
52 $tcp0 tracevar cwnd_
53 $tcp0 tracevar ssthresh_
54 $tcp0 tracevar ack_
55 $tcp0 tracevar maxseq_
56
57 #Create a TCP receive agent (a traffic sink) and attach it to B
58 set end0 [new Agent/TCPSink]
59 $ns attach-agent $B $end0
60
61 #Connect the traffic source with the traffic sink
62 $ns connect $tcp0 $end0
63
64 #Schedule the connection data flow; start sending data at T=0, stop at T=10.0
65 set myftp [new Application/FTP]
66 $myftp attach-agent $tcp0
67 $ns at 0.0 "$myftp start"
68 $ns at 1000.0 "finish"
69
70 #Run the simulation
71 $ns run
72

```

3. Przygotowano i uruchomiono następujący skrypt w Pythonie do obliczenia użycia kolejki i ilość pakietów poddanych retransmisji.

```

1  #!/usr/bin/python3
2  import nstrace
3  import sys
4
5  def queuesize(filename):
6      QUEUE_NODE = 1
7      nstrace.nsopen(filename)
8      sum = 0.0
9      size= 0
10     prevtime=0
11     while not nstrace.isEOF():
12         if nstrace.isEvent(): # counting regular trace lines
13             (event, time, sendnode, dnode, proto, dummy, dummy, flow, dummy, dummy, seqno, pktid) = nstrace.getEvent()
14             if (sendnode != QUEUE_NODE): continue
15             if (event == "r"): continue
16             sum += size * (time -prevtime)
17             prevtime = time
18             if (event=='d'): size -= 1
19             elif (event=="-"): size -= 1
20             elif (event=="+"): size += 1
21         else:
22             nstrace.skipline()
23
24     print("avg queue utilization=", sum/time)
25
26 def dup_counter(filename):
27     SEND_NODE = 1
28     DEST_NODE = 2
29     FLOW = 0
30     count = 0
31     COUNTS = {}
32     nstrace.nsopen(filename)
33     while not nstrace.isEOF():
34         if nstrace.isEvent():
35             (event, time, sendnode, dest, dummy, size, dummy, flow, dummy, dummy, seqno, dummy) = nstrace.getEvent()
36             if (event == "r" and dest == DEST_NODE and size >= 1000 and flow == FLOW):
37                 if (seqno in COUNTS):
38                     COUNTS[seqno] += 1
39                 else:
40                     COUNTS[seqno] = 1
41             else:
42                 nstrace.skipline()
43     for seqno in sorted(COUNTS.keys()):
44         if (COUNTS[seqno] > 1): print(seqno, COUNTS[seqno])
45
46
47 dup_counter("basic1.tr")
48 queuesize("basic1.tr")

```

#### 4. Zebranie wyników.

Rozmiar kolejki	Utilization (in packets)	Utilization (in percent)	Retransmitted packets
7	1.5133926127136077	21.61%	12
40	23.749696423238227	59.37%	52