

SIMON FRASER UNIVERSITY
SCHOOL OF ENGINEERING SCIENCE

Spring 2014
ENSC 427: COMMUNICATION NETWORKS
ENSC 894 SPECIAL TOPICS II: COMMUNICATION NETWORKS

Midterm No. 1
Wednesday, February 19, 2014

Duration: 50 minutes. Attempt all problems. Questions are not equally weighted.

Closed book and closed notes. Simple calculators (with no graphing/programming functions) are permitted. PDAs, laptops, and wireless phones are not permitted.

Please provide brief and concise answers and include diagrams, graphs, and tables, as needed. Expand all acronyms.

Please write legibly. Illegible text will not be graded. Please use a pen (no pencils, please).

1. Applications and Layered Architecture (20 points):

Consider an HTTP request message and its encapsulation:

- (a) Show encapsulation of PDUs in three layers below the application layer.
- (b) List the names of the three layers.
- (c) List the names of protocols.
- (d) Show the main content of each header.

2. Digital Transmission Fundamentals (35 points):

- (a) Plot Unipolar NRZ, Polar NRZ, and Manchester encodings for the sequence: 01110010.
- (b) Calculate the average transmitted power for each encoding.
- (c) List standards that use Manchester encoding.

3. Case Study: Gnutaldi (20 points):

- (a) Describe the main features of a P2P network.
- (b) What is the overlay network and the topology mismatch?
- (c) Briefly describe the main algorithms implemented in the Gnutaldi simulator.
- (d) Summarize main simulation results.

4. ns-2 Tutorial (25 points):

Consider the listed ns-2 code:

- (a) Using a *for* loop, define seven nodes and add them to an array named *n*. Insert your code in lines 16–18.
- (b) Insert appropriate code in lines 41–43 to stop the CBR traffic at time 4.5s, call the finish process at time 5.0s, and run the ns-2 simulation, respectively.
- (c) Briefly describe the events that occur after the execution of line 42 that calls the finish process.

```
1 set ns [new Simulator]
2
3 $ns rtproto DV
4
5 set nf [open midterm.nam w]
6 $ns namtrace-all $nf
7
8 proc finish {} {
9     global ns nf
10    $ns flush-trace
11    close $nf
12    exec nam out.nam &
13    exit 0
14 }
15
16                                     #fill in here for part (a)
17                                     #fill in here for part (a)
18                                     #fill in here for part (a)
19
20 for {set i 0} {$i < 7} {incr i} {
21     $ns duplex-link $n($i) $n([expr ($i+1)%7]) 1Mb 10ms DropTail
22 }
23
24 set udp0 [new Agent/UDP]
25 $ns attach-agent $n(0) $udp0
26
27 set cbr0 [new Application/Traffic/CBR]
28 $cbr0 set interval_ 0.005
29 $cbr0 attach-agent $udp0
30 $cbr0 set packetSize_ 500
31 set null0 [new Agent/Null]
32 $ns attach-agent $n(3) $null0
33
34 $ns connect $udp0 $null0
35
36 $ns at 0.5 "$cbr0 start"
37 $ns rtmodel-at 1.0 down $n(1) $n(2)
38 $ns rtmodel-at 2.0 up $n(1) $n(2)
39
40                                     #fill in here for part (b)
41                                     #fill in here for part (b)
42                                     #fill in here for part (b)
43
```