Department of Computer Science, Virtual University of Pakistan

CS716: Advanced Computer Networks

Assignment 2 **MS(CS), Spring 2012** **Maximum Points: 100**

Due Date: *Sunday, 10th June 2012*

Instructions

The purpose of this assignment is to give you hands on practice. It is expected that students will solve the assignments themselves. Following rules will apply during the evaluation of assignment.

- Cheating from any source will result in zero marks in the assignment.
- Any student found cheating in any of the two assignments submitted will be awarded "F" grade in the course.
- No assignment after due date will be accepted

Question No. 1 (10 + 10 + 10 + 10 = 40 Points)

a) An ATM network uses a token bucket scheme for traffic shaping. A new token is put into the bucket every 5 μsec. Each token is good for one cell, which contains 48 bytes of data. What is the maximum sustainable data rate?

b) Consider the following design problem concerning implementation of virtual-circuit service. If virtual circuits are used internal to the subnet, each data packet must have a 3-byte header and each router must tie up 8 bytes of storage for circuit identification. If datagrams are used internally, 15-byte headers are needed but no router table space is required. Transmission capacity costs 1 cent per 10^6 bytes, per hop. Very fast router memory can be purchased for 1 cent per byte and is depreciated over two years, assuming a 40-hour business week. The statistically average session runs for 1000 sec, in which time 200 packets are transmitted. The mean packet requires four hops. Which implementation is cheaper, and by how much?

c) For the network given in the following figure, give the datagram forwarding table for each node. The links are labelled with relative costs; your tables should forward each packet via the lowest-cost path to its destination.

d) Suppose a 100-Mbps delayed-release token ring has 10 stations, a ring latency of 30 µs, and an agreed-upon TTRT of 350 µs.
(i) How many synchronous frame bytes could each station send, assuming all are allocated the same amount?
(ii) Assume stations A, B, C are in increasing order on the ring. Due to uniform synchronous traffic, the TRT without asynchronous data is 300 µs. B sends a 200-µs (2.5-Kb) asynchronous frame. What TRT will A, B, and C then sees on their next measurement? Who may transmit such a frame next?

Question No. 2 (10 + 10 + 10 = 30 Points)

a) ARP and RARP both map addresses from one space to another. In this respect, they are similar. However, their implementations are fundamentally different. In what major way do they differ?

b) What is the total efficiency of ATM using AAL2 & describe the Format of an ATM cell?

c) Explain why padding is unnecessary in AAL1 and AAL2, but necessary in AAL3/4 and AAL5?

Question No. 3 (10 points)

Read the attached research paper entitled **"Wireless Medium Access Control Protocols"** with this assignment very carefully. Answer the following questions:

1. Why packet transmission is vulnerable in RI-BTMA? Does RI-BTMA solve hidden node problem completely? Discuss in the light of paper.
2. According to authors, why it is difficult to compare different MAC protocols? Give a detailed but to the point answer in the light of paper.

While evaluating your answer, following rules will apply.

1) Copied answer will result in 0 marks
2) Any student found cheating in any of the two research papers summary submitted will be awarded "F" grade in the course.
3) Avoid using same wording from the research paper.

Useful Web Resources

Some useful resources are available on the Internet that can guide you about: how to read, write, evaluate, and summarize research papers.

1) http://www.ruf.rice.edu/~bioslabs/tools/report/reportform.html
2) http://helios.hampshire.edu/~apmNS/design/RESOURCES/HOW_READ.html
3) http://www.library.dal.ca/how/termpaper.htm
4) http://www.studygs.net/wrtstr8.htm

Question No. 4 (10 points)

Read the attached research paper entitled **"Routing in Multiple Layers: Challenges and Opportunities"** with this assignment very carefully. Answer the following questions:

1. Elaborate the challenges in multiple layer routing environments discussed by authors. Give your suggestions about to possible ways to tackle each challenge.
2. Classify the expected research opportunities in sight of discussed challenges by authors in this paper.

While evaluating your answer, following rules will apply.

1) Copied answer will result in 0 marks
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5) http://www.ruf.rice.edu/~bioslabs/tools/report/reportform.html
6) http://helios.hampshire.edu/~apmNS/design/RESOURCES/HOW_READ.html
7) http://www.library.dal.ca/how/termpaper.htm
8) http://www.studygs.net/wrtstr8.htm

Question No. 5 (10 points)

Consider the following topology.

Each link is a duplex link with 5Mb bandwidth and 10msec delay. Nodes 1 and 2 send UDP data to node 4, each with packet size of 1000 bytes and 500 packets per second. Nodes 1 and 2 start sending data at 0.5 sec and stop at 4.5 sec. Create a trace file for the simulation and execute *nam* to view the simulation.

a) Write tcl script for the above simulation scenario in file 'assign1.tcl'.
b) Node 3 is an intermediate node, why it discards some packets from its queue?

NOTE: Students can use installations guide available on the Internet.

Useful Web Resources.

1) www.isi.edu/nsnam/ns/
2) www.perform.wpi.edu/NS/
3) http://en.wikipedia.org/wiki/Ns_(simulator)
4) http://www.nsnam.org/