PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Final Examination Semester I : Academic Year : 2004

Date : 10 October 2004 Time : 9.00 – 12.00 Room : R300

Subject : 240 – 575 Special Topics in Information Network Engineering II

(Differentiated Services in the Internet)

Instruction:

- Make sure that there are 4 problems (100 points) in your exam paper.
- This exam is **OPEN BOOK** and you have 3 hours to complete your exam.
- All of your answers can be written either in Thai or English.
- Dictionary and Calculator are allowed.
- No palm pilots or computers are allowed.

Problem 1 Differentiated Services Internet Model (10 points)

Explain why it is difficult to give a fair share of available resources to individual flows sharing the same QoS class of Differentiated Services Internet although the Quality of Service of that class can be achieved.

Problem 2 MPLS (10 points)

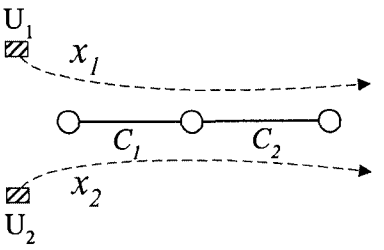
Why MPLS is suitable to support Quality of Service (QoS) provisioning for adaptive real-time multimedia applications in the Internet? *(10 points)*

Problem 3 Optimization Flow Control (30 points)

3.1 Compare packet marking (or dropping) policy for congestion control used in Random Early Detection (RED) and Random Exponential Marking (REM) router mechanisms. *(10 points)*

3.2 Regarding the global optimization problem for solving the congestion control problem in the Internet as shown in Figure1 below, *(20 points)*

- Explain why this problem is not practicable to use in the real networks,
- Explain how this problem is modified in such a way that the source and link models of Random Exponential Marking (REM) mechanism are developed.
- Explain how the REM algorithms in both link (router) and users can work cooperatively towards achieving the optimal fair of bandwidth sharing among contending users after several iterations.



System Problem *(welfare maximization)*

$$\max_{x_s \geq 0} \quad \sum_s U_s(x_s)$$

$$\text{subject to} \quad \sum_{s \in S(l)} x_s \leq C_l, \qquad \forall l \in L$$

where S users, each wants a share of bandwidth on each link C_l, $l = 1$ *and* 2

Users simultaneously request shares $x_1, \ldots, x_2$

Figure1

Problem 4 Various Topics in Research Papers (40 points)

4.1 Describe a possible mechanism that is claimed to be efficient in the support of Integrated Service Internet (IntServ)/RSVP reservation over MPLS domain. Also, describe how the scalability issues that causes from a large number of RSVP sessions can be avoided.

4.2 Describe the benefit of making traffic conditioning at the entry point of DiffServ becoming adaptive to the network congestion and also a possible approach for adaptive traffic conditioner.

4.3 Describe the differences of the absolute and relative differentiated services in the Internet and give reasons why the mechanisms of relative differentiated services can be better served adaptive applications than those of absolute differentiated services.

4.4 Describe key problems that make typical TCP flows operate inefficiently in the high-speed networks. Also, give suggestion how these problems can be alleviated in the literature.

Suntorn Witosurapot

October 2004