

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination Semester I : Academic Year : 2002
Date : 3 October 2002 Time : 9.00 – 12.00 Room : R200
Subject : 240 – 575 Special Topics in Information Network Engineering II
(Differentiated Services in the Internet)

Instruction:

- Make sure that there are 4 problems (40 points) in your exam paper.
- This exam is closed 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 other hand held computers are allowed.

Problem 1 (10 points) True or False

- In MPLS, label swapping occurs only at the edges of the network, *i.e.*, in the Label Edge Routers (LERs).
- LDP uses UDP for reliable transmission of signaling information between LSRs.
- In the differentiated services (Diffserv) architecture, a packet's mark is carried within the so-called Differentiated Services (DS) field in the IPv4 or IPv6 packet header.
- Per-hop-behaviors (PHBs) standardized by the IETF specify scheduling and queue management mechanisms that must be implemented for each service class defined by the DiffServ architecture.
- The Expedited Forwarding (EF) PHB implies some form of isolation among service classes, since this guarantee is made independently of the traffic intensity of any arriving flows with other DSCPs.
- The Assured Forwarding (AF) PHB uses non-preemptive head-of-line priority queuing to distinguish among packets with different DSCPs.
- In a typical differentiated services (Diffserv) scenario, routers at the ingress to a Diffserv network would be configured to perform multi-field classification on packets and mark these packets with one of a number of DSCPs.
- The effectiveness of congestion control in Random Exponential Marking (REM) routers does not rely on cooperation of users.
- Random Exponential Marking (REM) mechanism in routers can be set to drop packets, instead of marking packets, during congestion.
- Measurement based Admission Control (MBAC) algorithms are well supported for maximum guaranteed resource provisioning in the network.

Problem 2 QoS Provisioning Mechanisms in the Internet (20 points)

Describe the following issues related to QoS provisioning mechanisms in the Internet:

2.1 RSVP and DiffServ Integration. (5 points)

Problem(s) to solve:

Solution approach:

2.2 QoS Routing mechanisms (5 points)

Problem(s) to solve:

Solution approach:

2.3 Core Stateless Fair Queuing or Rainbow mechanisms (5 points)

Problem(s) to solve:

Solution approach:

2.4 Measurement based Admission Control (MBAC) algorithms (5 points)

Problem(s) to solve:

Solution approach:

Problem 3 MPLS (10 points)

3.1 What is a Label Switch Path used in Multi Protocol Label Switching (MPLS)? (4 points)

3.2 Why MPLS is suitable to support Quality of Service (QoS) provisioning for adaptive real-time multimedia applications in the Internet? (3 points)

3.3 Describe an approach that can be generally used to solve the problem of insufficient class representation between DiffServ and MPLS when they are operated in the same network. (3 points)

Problem 4 REM and Congestion Pricing (10 points)

4.1 Compare packet marking (or dropping) policy for congestion control used in Random Early Detection (RED) and Random Exponential Marking (REM) router mechanisms. (5 points)

4.2 Explain how REM router and responsive user mechanisms can be cooperatively worked in such a way that optimal fair share of congested resources in the network can be achieved. (5 points)

Suntorn Witosurapot

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