ECSE-489 : TELECOMMUNICATION NETWORK LAB
WINTER 2003
(2 CREDITS)

Experiment 5

Introduction

This experiment is designed to explore two aspects of networking: (1) LAN operation and multiple access protocols and (2) IP (routing) protocols. The experiment involves OPNET simulation. Your goal should be to design and perform experiments that enable you to address the questions below. In the demonstration session, you will be asked to justify your experiments, describe how they were performed, and demonstrate key steps in your procedure.

The report must be at most 8 pages in length (not including title page, contents, references). They're getting shorter!

PART 1: LAN SIMULATIONS

Your starting point should be the **LAN_exp5** project that we provide.

Exercise 1.1

Explore the performance of a network ring architectures operating using:

(i) the ethernet MAC protocol, and
(ii) the token ring multiple access protocol.

1. With a fixed, default traffic load (Interarrival time exponentially distributed with mean 0.002 for Token Ring and 0.0004 for Ethernet, packet size exponential~1024, ON state exponential~10, OFF state exponential~90) at every station in the ring, compare the efficiency (utilization) achieved using Ethernet and token ring as the hop propagation delay of all connections in the ring increases. (Note: for the Token Ring, change this at the node; for Ethernet change it at the link)
2. With a fixed propagation delay of 3.3E-06 on every link in the ring, compare the average packet delay as a function of traffic load.

PART 2: ROUTING EXPERIMENTS

Section 2.1: IP

Your starting point should be the **OSPF_exp5** project that we provide. For Parts (i) to (v), use Scenario 1. For Part (vi) use Scenario 2.

(i) Estimate how long the routing algorithm takes to converge. What are the routes OSPF assigns to the traffic demands? How does OSPF determine the interface (link) costs?

(ii) Which is the most heavily utilized link after convergence?

(iii) If your aim were to minimize the peak utilization throughout the network (the maximum on any link) and you were able to upgrade the capacity of one link, which link would you choose? You may change a DS3 to an OC1, an OC1 to an OC3, and an OC3 to an OC12.

(iv) Can you achieve a better effect by assigning link costs explicitly?

(v) If link B-C fails, how do the routes of the traffic demands change?

(vi) Switch to Scenario 2. Suppose that link B-C has a high chance of failure. Assign interface costs that ensure there is no overloading of the network in the case of failure.