Chapter 6

Conclusions and Future Studies

6.1 Conclusions

In this work, we present an approach for the fair resource allocation problem and QoS routing in All-IP networks that offer multiple services to users. Users' utility functions are summarized by means of achievement functions. First, we find that the achievement function can map different criteria onto a normalized scale. The achievement function also can work in the Ordered Weighted Averaging method. Moreover, it may be interpreted as a measure of QoS on All-IP networks. Using the bandwidth allocation model, we can find a Pareto optimal allocation $\mathbf{x}^*$ of bandwidth on the network under a limited available budget, and this allocation can provide the so-called proportional fairness to every class i. That is, this allocation can provide the similar satisfaction to each user in all classes. We also find the bandwidth allocated to each class i. Moreover, we obtain the maximal rate, which the link can offer to each class. Next, we present a routing scheme under considering the delay. This scheme aims at seeking a path for which the residual maximal rate (i.e., after establishing the new connection) of its bottleneck link is maximal. This optimal path provides the End-to-End QoS guarantees to each user.

6.2   Future Studies

The design and control of modern communication networks raises several issues well suited to study using techniques of operational research such as optimization, network programming and stochastic modelling. The Internet comprises many smaller networks, each separately owned and operated. Economists, applied mathematicians, and engineers are joining research efforts to help develop the next generation of networks. No one can say what paths networks will take, but one thing is certain: As networks grow on a global scale, and telephone, data, and even television networks are combined, network models will grow in importance. In the future, we will deal with the delay problems of the routing path under randomness. We will keep on investigation of the constraints on the All-IP networks and trying to find and prove some properties of fair resource allocation in our future research.