

SUMMARY OF Ph.D. DISSERTATION

School School of Science for Open and Environmental Systems	Student Identification Number	SURNAME, First name HATANO, Tomoya
Title <p style="text-align: center;">Bandwidth Control Methods Achieving Effective, Fair Data Transmission</p>		
Abstract <p>Since the application that needs network communication increases and the number of broadband consumers continues to increase, the number of connections is rising and connections are diversifying such as connection that utilizes long-distance links between countries or satellite links and connection that needs Giga bit level bandwidth. In this background, link delay gets long from that associated with extended network area and the network bandwidth gets wider. The service is required to transmit data to various connections efficiently and fair between connections. Though link delay of the network gets large and the network bandwidth gets wider, the network still must provide high service quality to connection; requirements faced by the current network.</p> <p>The purpose of this thesis is to research bandwidth control methods that achieve high service quality even bandwidth-delay product of the network is large. This thesis reports on bandwidth control methods that allocate bandwidth efficiently so as to achieve fairness between users assuming that the Diffserv network is provided for sets of connections with different RTTs from that associated with bandwidth widening. Moreover, it reports on a bandwidth control method in case the network bandwidth is increased.</p> <p>Bandwidth-delay product network has following issues. When the RTTs of connections are different, the connection with longer RTT increases bandwidth more slowly than flow with shorter RTT. Therefore, the connection with shorter RTT can get more bandwidth than the other. TCP connection with wide bandwidth and long link delay cannot achieve adequate transmission rate, because the connection increases bandwidth by the significantly small amount.</p> <p>To resolve the issues associated with large bandwidth-delay product, this thesis separates the fairness problem caused by connections with different RTTs, and improves efficiency and fairness between connections as metrics of service quality. For the fairness problem caused by different RTT, this thesis takes the method improving end host performance and the method improving the cooperation of end hosts and network routers. For the efficiency problem caused by wide bandwidth and long link delay, this thesis takes the method improving network router performance in the network layer.</p> <p>Through computer simulation, proposed bandwidth control methods are proved to improve fairness and efficiency and verified to be able to provide high service quality. This thesis clarifies the effect of each method and the relation between each method and service quality.</p>		