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論文題目： 高速 LAN プロトコルに関する研究

英訳題目： A New Protocol for High-speed Local Area Networks

### **Abstract**

So far, Local Area Networks (LANs) have been installed as private facilities in a limited area to construct distributed network systems. But, recently, the LANs have been a basic technology for information exchange between high-speed peripheral devices and multimedia communications. The LANs, also, are a fundamental element (domain) of internetworking to construct high-tech information processing systems. Therefore, it is strongly demanded to develop a new LAN protocol supporting a super high-speed multimedia communications and preparing easy interconnection methodology among LANs.

For dealing with this problem, the Fiber Distributed Data Interface (FDDI) was standardized for 100 Mbps LAN protocol. However, the processing of the multimedia communications is difficult and the advent of Mbps or Gbps LANs is eagerly expected to support higher performance requirement.

In this work, to resolve the above mentioned problems, we propose a new ring access control protocol referred to as the self-token protocol. The self-token protocol realizes an efficient spatial reuse of ring capacity by combining the multiple-token method and the buffer insertion method together. Furthermore, the self-token protocol works also as a fairness mechanism. The self-token protocol has two operation modes: the station priority and ring priority. These two operation modes of the self-token protocol are analyzed by approximate analysis and the simulations.

Furthermore, the comparison performance of the proposed self-token protocol and the conventional protocols is carried out. From the simulation results we conclude that the self-token protocol has good properties. It has a high throughput and a low delay derived from the buffer insertion method, and a fair regulated packet transmission derived from the token access method. Furthermore, the ring priority method can be used for multimedia

communications.

Next, a new Adaptive Bandwidth Allocation (ABA) method for dual rings LAN is proposed. The performance behavior of the ABA method is investigated by simulations. From the simulations results we conclude that the proposed ABA method shows a good throughput compared with the conventional methods. The ABA protocol allocates the bandwidth dynamically, therefore even for rapid changes of the bandwidth a flexible bandwidth allocation is achieved. In the conventional bandwidth allocation methods, the throughput characteristics decrease if the traffic changes. In the ABA method the throughput characteristics don't decrease when the traffic changes. Furthermore, we propose the use of the ABA method for multimedia communication. The efficiency of the ABA method is investigated by simulations

This thesis consists of six chapters.

In chapter 1, we introduce the background, the purpose and the outline of this thesis.

In chapter 2, we explain general topics about LAN. This chapter covers introduction, the computer networks types; the LAN types which include the star LAN, bus LAN and ring LAN; the access methods for the ring LANs which includes token ring method, FDDI method, slotted ring method, buffer insertion method and MetaRing method; the high-speed LAN necessary conditions; the comparison of the conventional methods; and conclusions.

Chapter 3 is devoted to the Station Priority (SP) self-token protocol.

After the introduction, we present the basic operation of the SP self-token protocol, packet format and priority transmission. Next, we carried out the performance evaluation which includes approximate analysis, buffer insertion protocol analysis and SP self-token protocol analysis. After that, we introduce the simulation results and finally, conclusions.

In chapter 4 is presented the Ring Priority (RP) self-token protocol. This chapter is divided in six parts. The first part is introduction. The second part gives the basic operation of the RP self-token protocol. The third part deals with performance evaluation which includes approximate analysis, buffer insertion protocol analysis, RP self-token protocol analysis, throughput characteristics and fairness characteristics. In the fourth part is treated RP self-token protocol advantages which includes round method, timer method and comparison. The fifth part is devoted to multimedia communications which includes the priority control in the station, the priority control in the system, bandwidth reservation mechanism and simulations. The last part is conclusions.

Chapter 5 treats the load adaption bandwidth method. After the

introduction, the drawbacks of the conventional methods are given. Next, we introduce the basic operation of the ABA method, which includes the fairness control and adaptivity control. After that, we deal with the applications toward the multimedia communications, which includes the priority control in the station, the priority control in the system, bandwidth reservation mechanism and simulations. In following, the performance evaluation is treated. It includes throughput characteristics (packet mode and cell mode), the bandwidth allocation for the dynamic traffic and the evaluation of the multimedia communications. Finally are given the conclusions.

Chapter 6 concludes this work. We give the general conclusions and the points for the future research.