The Application of Token Rings to Local Networks of Personal Computers

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Introduction

It is the thesis of this short note that a network which operates by passing a control token sequentially around a loop, much like that of the Distributed Computing System [FARB 73, FARB 75] is appropriate for at least two forthcoming kinds of local personal computer networks. High end personal scientific computers will probably require very high bandwidth (50 Mhz) local networks, a requirement well suited for a token type ring network. At the other end of the spectrum, a low bandwidth (300 baud) network for low cost home or business personal computers may be established that use the conventional phone system and a variation of the token ring for arbitration.

Super PC's and Rings

The first kind of local personal computer network that rings are emminently suitable for are networks of "high end personal computers" which may require substantial bandwidth for the exchange of fairly large files and programs. These personal computers will probably be priced between $20Kand $50K and will be characterized by having an execution rate of 1 MIP, a large virtual address space, between 1/2 and 1 Mbyte of primary memory, a high quality raster display, and 50-100 Mbytes of local secondary storage. Although not currently available at these prices, configurations like these now belong to the "super-mini" class of machines.

Experience has shown [GORD 80] that large numbers of engineers and scientists can productively work in an environment where many machines that have the characteristic of a scientific personal computer are networked together via a ring. Although, the collection of machines are not considered to be personal computers because the price range is higher than desired, many of the users would be happy to have their own machine or share it with only a few others. Even though applications requiring the cooperative involvement of several computers in a local network are still rare, the need for networks of higher bandwidth than currently used (8 Mhz) is obvious. The advent of fiber optics will allow signalling speeds to reach at least 50Mhz and possibly even higher. Under such circumstances, the ratio of arbitration time to packet transmit time definitely begins to favor the use of a circulating token rather than a broadcast contention method for physical networks of several thousand meters.

Local Community PC Networks

One attractive use of a low cost personal computer is to exchange information with other persons concerning hobbies, community affairs, special interest groups, etc. To date, methods for accomplishing such exchanges are relatively ad hoc. At least two major requirements for establishing a private network for a group of PC owners are that it be low cost and that it be easily and dynamically reconfigurable. A network based on the concept of a cir-

culating token should fill both requirements.

Since a token ring operates in a point to point fashion any low cost personal computer configured with an auto call/auto answer modem could participate in a token ring network, where the token is passed by calling the "next" node in a network. Algorithms for determining new configurations because of a "failed link" or node (determined by a no answer condition) are possible [GORD 79] as well as algorithms for contracting and enlarging the network as members join or leave.

References

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